VII Euro-Asian Symposium «Trends in MAGnetism»

September 08–13, 2019, Ekaterinburg, Russia

M.N. Miheev Institute of Metal Physics UB RAS

SYMPOSIUM PROGRAM

Symposium is supported by:

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ЭМТИОН NT-MDT ООО "ЭМТИОН"

Contents

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VENUE

M.N. Miheev Institute of Metal Physics of the Ural Branch of the Russian Academy of Sciences

M.N. Mikheev Institute of Metal Physics of the Ural Branch of the Russian Academy of Sciences (IMP UB RAS) is the largest academic institute in the Ural Federal District and Russia's research flagship in such fields as material science, physics of magnetic phenomena and metallic nanostructures, nondestructive testing, radiation physics of solids, theory of strongly correlated electron systems.

Hystorical facts

IMP UB RAS was established by the decision of the Presidium of the Supreme Economic Council of the USSR, № 294 "About the organization of research work in the Urals and Siberia" dated May 17, 1931. It was originally called the Ural Physico-Technical Institute (UPTI), The parent Leningrad Physical-Technical Institute (LPTI) headed by Prof. A.F. Ioffe was ordered to form a group of employees to work in the Urals (the order of LPTI dated January 20, 1932 № 5).

On July 1, 1932, being a postgraduate student of UPTI, Mikhail Mikheev (1905–1989) became its first director. He headed the Institute until 1986 (with two career intermissions). Later he was elected Corresponding Member of the USSR Academy of Sciences, awarded the USSR State Prize, and the title "Honored Worker of Science and Technology of the Russian Soviet Federal Socialist Republic".

IMP's buildings

IMP's major research activities

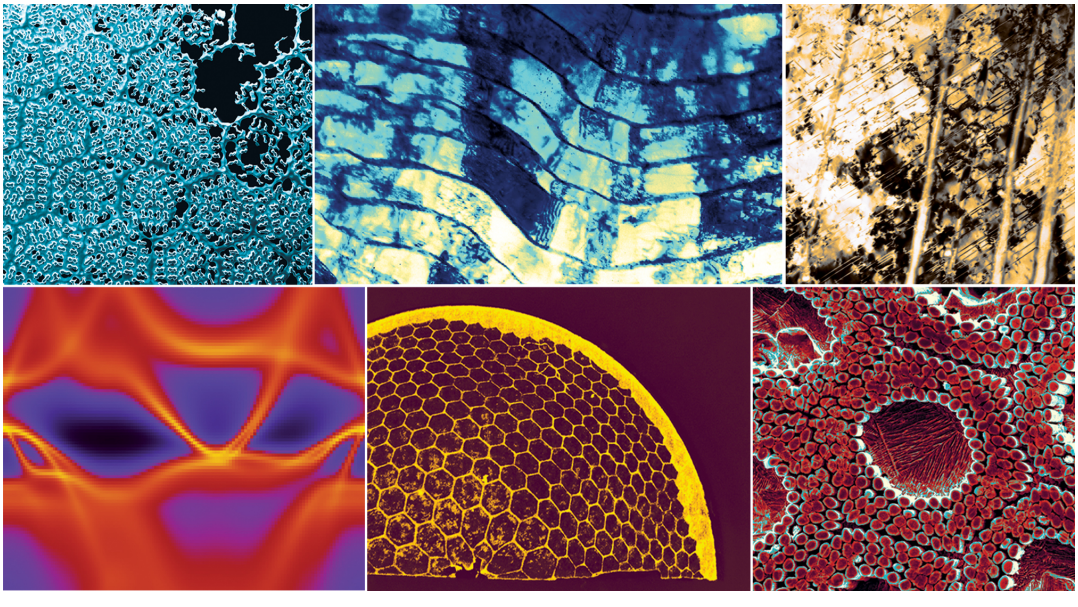
• Electronic structure, electron-electron interactions and physical properties of transition, rare-earth, and actinide metals, their alloys, and compounds, and low-dimensional semiconductor systems.

• Magnetic structures, the spin transport and methods of directional modification of the physical properties of functional magnetic materials based on metallic and semiconductor heterostructures, intermetallics, and metal compounds in the crystalline, nanostructural, and amorphous states.

• Physical principles of diagnostics of complex systems consisting of metallic materials and their products by means of electromagnetic and acoustic fields to provide technology-related and environmental safety.

• Dislocation structures, phase transitions and physico-mechanical properties of steels and alloys of non-ferrous and precious metals, intermetallic compounds, and composites; development of advanced structural materials and their treatment methods for the needs of engineering and medicine.

• Atomic structural transformations, nonlinear phenomena, and non-equilibrium processes in condensed matters under intense radiation, thermal, deformation, and shock impacts.



The Collaborative Access Center "Testing Center of Nanotechnology and Advanced Materials"

The Institute of Metal Physics has all the necessary equipment to fabricate objects for investigation, expose materials and products to extreme treatments and study their physical properties. To efficiently use the unique equipment, IMP set up Collaborative Access Center "Testing Center of Nanotechnology and Advanced Materials", and "Physics-Technological Infrastructural Complex".

The Collaborative Access Center "Testing Center of Nanotechnology and Advanced Materials" (TC NTAM) was organized in 2008 to perform scientific research at a modern level. TC NTAM has unique and expensive equipment and comprises the following 7 departments:

- *Pulsed Magnetic Field Center*
- *Cryo-technological Center*
- *Magnetometry Center*
- *Strong Magnetic Field Center*
- *Very Low Temperature Center*
- *Chemical-analytical Center*
- *Electron Microscopy Center*

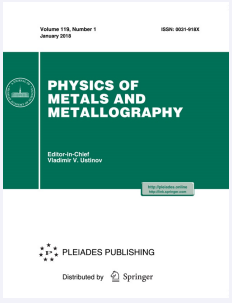
The main activities of TC NTAM are analytical execution of fundamental and applied research in the field of physical properties of materials, primarily of solids, metals, alloys, nanomaterials and nanostructures within research programs carried out not only by the Institute of Metal Physics but also by other organizations of the Ural Branch of the Russian Academy of Sciences, various industry enterprises and research institutes of the Ural region. TC NTAM provides analytical support to federal, regional and international projects and programs, as well as analytical and metrological support to the development and implementation of products of high technologies, innovations and science-absorbing industry.

All of the research are performed by highly qualified personnel. The number of TC NTAM's employees amounts to 66, including 3 Dr.Sc. and 20 Cand.Sc. both in Physics and Mathematics and in Engineering, highly-qualified specialists applying the unique equipment, and young employees that are constantly improving their skills.

Journals

The Institute of Metal Physics is the co-founder and base institution of such journals of the Russian Academy of Sciences as *The Physics of Metals and Metallography* and *Russian Journal of Nondestructive Testing*, which are issued in Russian and English.

The Physics of Metals and Metallography and *Russian Journal of Nondestructive Testing* are peer reviewed journals.



The Physics of Metals and Metallography (Fizika metallov i metallovedenie) was founded in 1955 by the USSR Academy of Sciences. Its scientific profile covers the theory of metals and metal alloys, their electrical and magnetic properties, as well as their structure, phase transformations, and principal mechanical properties. The journal publishes scientific reviews and papers written by experts involved in fundamental, application, and technological studies. The annual volume of publications amounts to 250 papers submitted from 100 leading national scientific institutions.

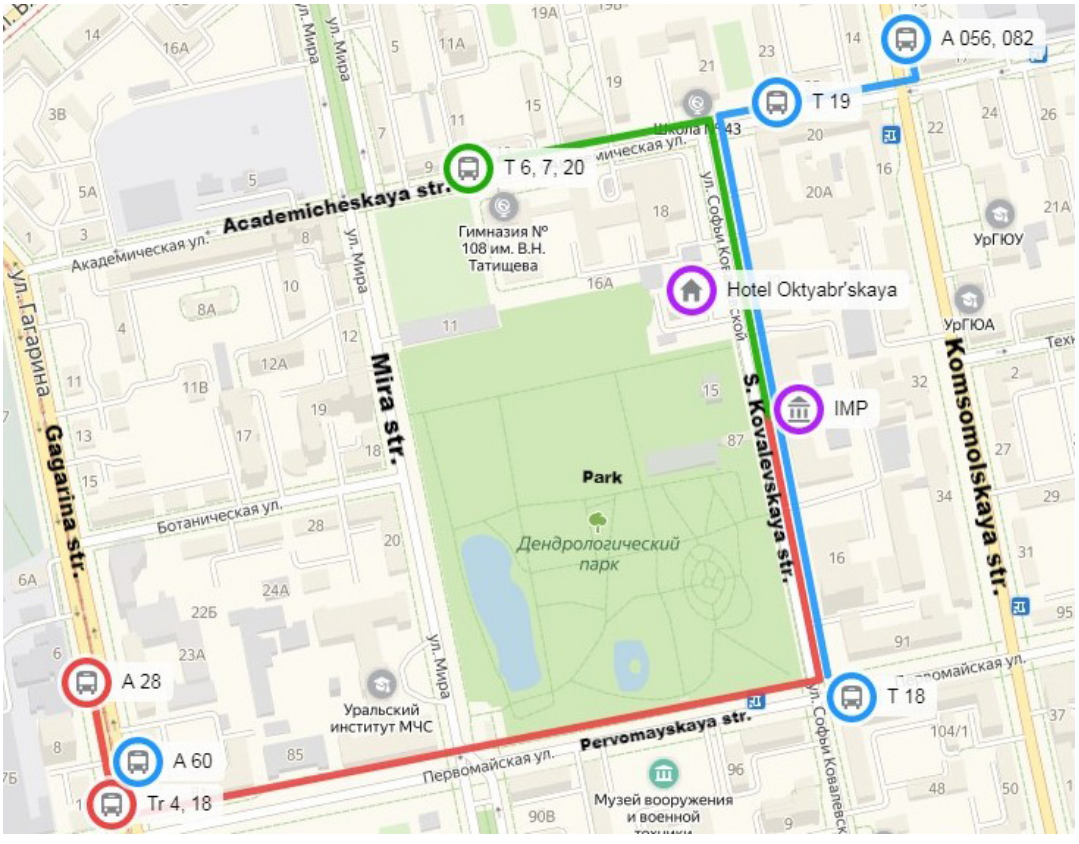
Impact Factor is 1.169
JCR® Category is METALLURGY & METALLURGICAL ENGINEERING;
Quartile in Category is Q3

Russian Journal of Nondestructive Testing is a journal that describes current research on the theory and technology of nondestructive testing of materials and components. It describes laboratory and industrial investigations of devices and instrumentation and provides reviews of new equipment for batch production. Articles cover all physical methods of nondestructive testing, including magnetic and electrical; ultrasonic; X-ray and Y-ray; capillary; liquid (color luminescence), and radio (for materials of low conductivity).

Impact Factor is 0.677
JCR® Category is MATERIALS SCIENCE, CHARACTERIZATION & TESTING;
Quartile in Category is Q4

Venue map

The Institute of Metal Physics (IMP) is located at 18, Sophia Kovalevskaya street.



IMP location & nearest public transport stops. A — bus, T — trolleybus, Tr — tram

Nearest public transport stops

• **To the city center (Hotel "Centralnaya"):** trolleybuses No. 6, 7, 20 from the stop "Mira" (green mark).

• **To the city center ("Ploshchad 1905 goda", "Ploshchad Truda", "Vostochnaya"):** tram No. 18, bus No. 28. The distance from the IMP main building to the bus stop is 800 m (red mark).

• **To the railway station:** buses No. 056, 082, trolleybus No. 19 from the stop "Academicheskaya", bus No. 60 from the stop "Pervomaiskaya", trolleybus No. 18 from the stop "S. Kovalevskaya" to the stop "Railway station" (blue marks).

• **The station "Pervomaiskaya" (to the train "Express Koltsovo")** can be reached by trams No. 4, 18 to the stop "Vostochnaya".

The fare in Ekaterinburg public transport (tram, trolleybus, bus) is *28 rubles*, in the metro — *32 rubles.*

Taxi

Participants can use taxi services if necessary.

Recommended companies:

- **“Yandex taxi”** (343) 266-66-66
- **“Tri desyatki”** (343) 310-10-10
- **“Vezet”** (343) 380-00-00.

It is possible to get a taxi by applications for the smartphone. Estimated fare from IMP to the city center or railway station is *200 rubles*.

Maps

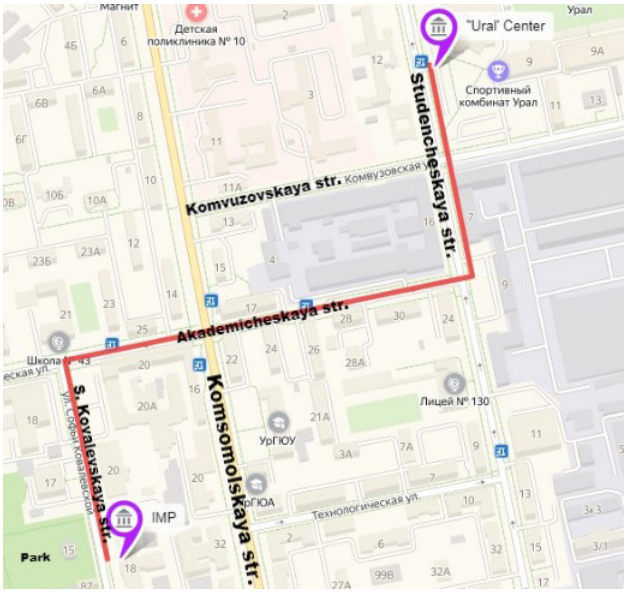
You can find the free map of Ekaterinburg at the site **www.2gis.ru**. Versions for smartphones are available.

Other sites with the map of Ekaterinburg:

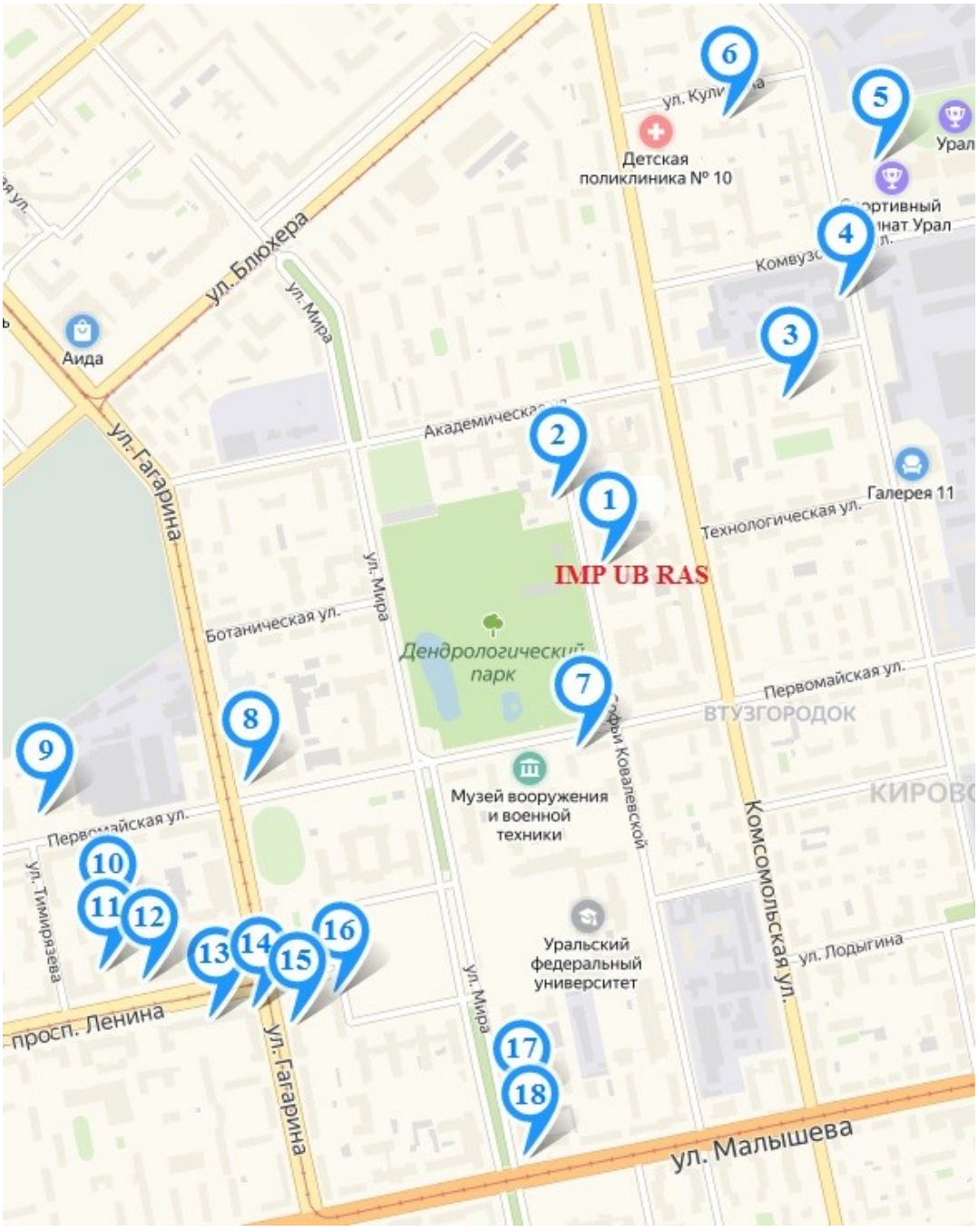
- **http://maps.google.com/**
- **http://www.e1.ru/info/citymap/**
- **http://maps.yandex.ru/**

“Ural” Center

To the “Ural” Center (see the map “Ural” Center” — red line) to the right from the main building of the IMP on the street S. Kovalevskaya to the intersection with Academicheskaya street, then to the intersection with Studencheskaya street and turn left. The distance is 1000 m.



Places for lunch or dinner

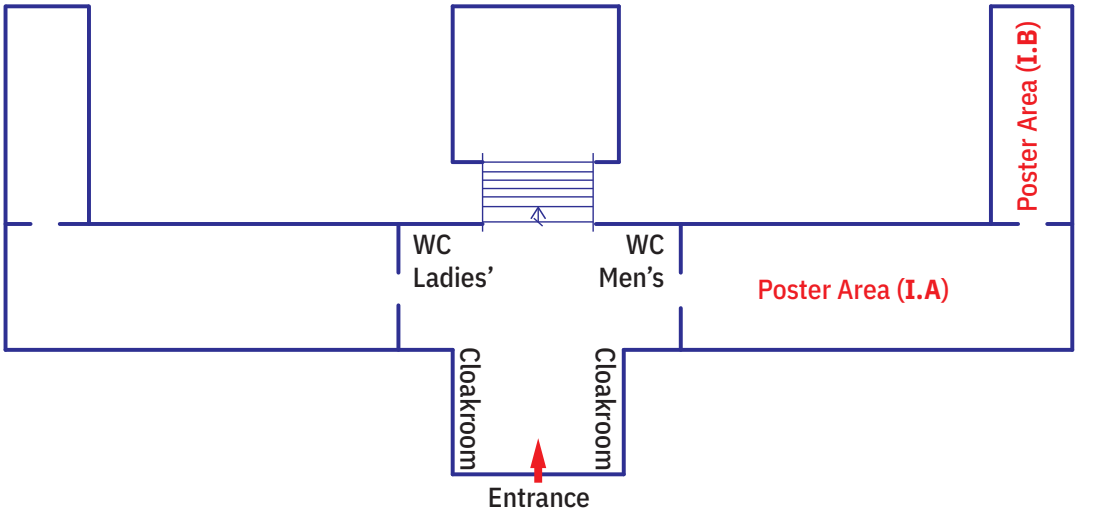


1. **Canteen, IMP UB RAS** *18 S. Kovalevskaya Street*
   Only cash
2. **Vremena goda, restaurant**
   Hotel "Oktyabr'skaya", 17 S. Kovalevskaya St.; 150 m
   Business lunch from 350 rub.; Average bill 2300 rub.
3. **Bigly, bar-restaurant** *28a Academicheskaya Street; 650 m*
   Business lunch from 210 rub.; Average bill 700 rub.
4. **Obedov, canteen** *16 Studencheskaya Street; 850 m*
   Average bill 130 rub.
5. **Ural, cafe** *3 Studencheskaya Street; 1.1 km*
   Business lunch from 170 rub.; Average bill 700 rub.
6. **Kulibin soul kitchen, cafe** *2 Kulibina Street; 1.1 km*
   Business lunch from 210 rub.; Average bill 500 rub.
7. **Campus Coffee, coffee house** *98 Pervomaiskaya Street; 330 m*
   Business lunch from 150 rub.; Average bill 250 rub.
8. **Skoroed, cafe (pancake)** *27 Gagarina Street; 850 m*
   Average bill 150 rub.
9. **Cafe na Pervomaiskoy** *75 Pervomaiskaya Street; 1.1 km*
   Average bill 150 rub.
10. **Electron, canteen** *97a Lenina Avenue; 1.5 km*
    Business lunch 119 rub.; Average bill 120 rub.
11. **Matushka, cafe** *97 Lenina Avenue; 1.4 km*
    Business lunch from 130 rub.; Average bill 300 rub.
12. **Bol'shie tarelki, cafe** *99 Lenina Avenue; 1.3 km*
    Business lunch from 199 rub.; Average bill 750 rub.
13. **Vilka-Lozhka, restaurant** *70 Lenina Avenue; 1.3 km*
    Business lunch 129 rub.; Average bill 129 rub.
14. **Vecherya u Solokhi, tavern** *18 Gagarina Street; 1.2 km*
    Business lunch from 350 rub.; Average bill 1000 rub.
15. **Papa Jones, pizzeria** *33 Gagarina Street; 1.1 km*
    Business lunch 250 rub.; Average bill 700 rub.
16. **Dodo Pizza, pizzeria** *72 Lenina Avenue; 1.0 km*
    Business lunch 195 rub.; Average bill 350 rub.
17. **Yapona Mama, restaurant** *23 Mira Street; 1.1 km*
    Business lunch from 290 rub.; Average bill 550 rub.
18. **8'500 Pan American, cafe-bar** *23 Mira Street; 1.2 km*
    Business lunch from 200 rub.; Average bill 800 rub.

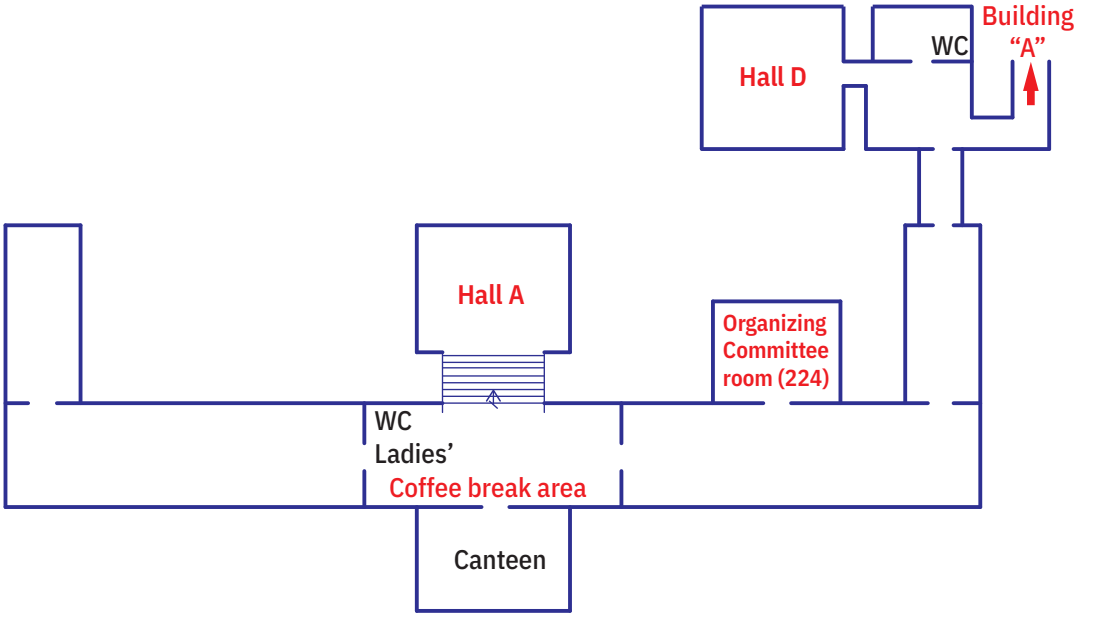
Scheme of halls in IMP

Main building

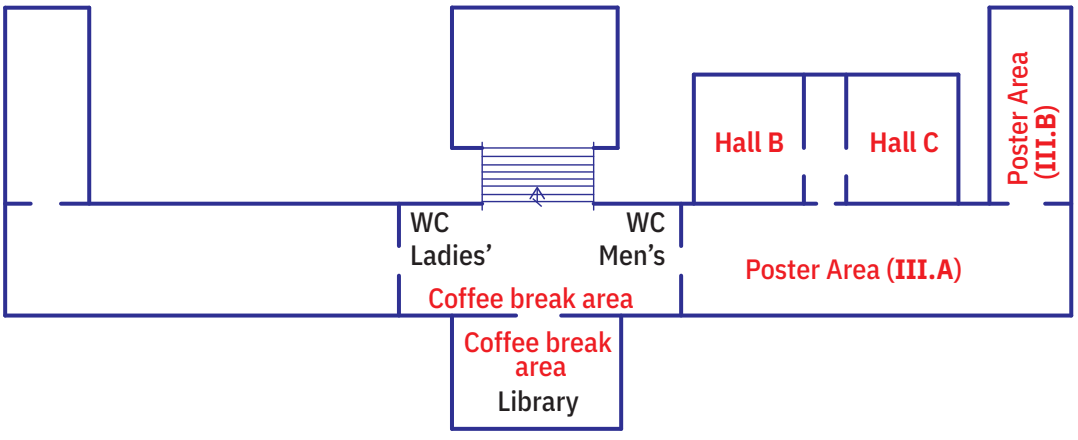
1st floor



2nd floor

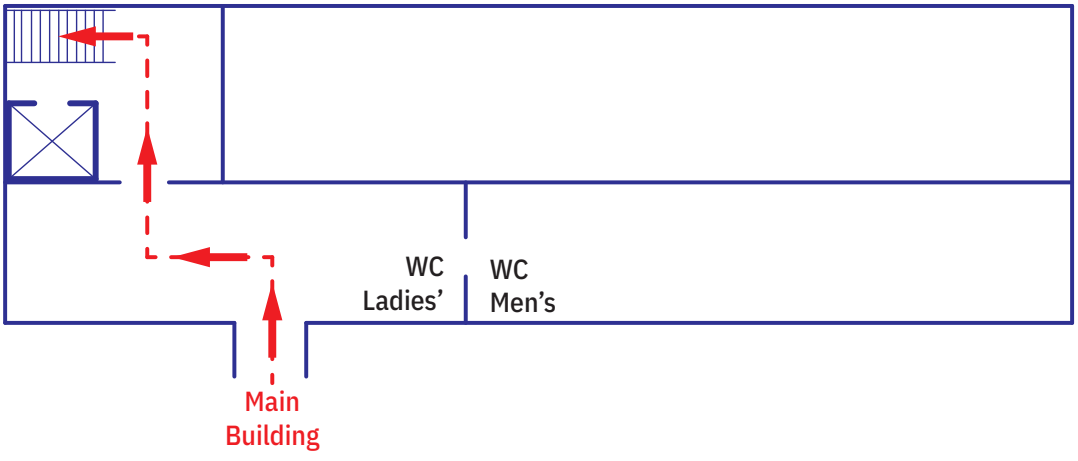


3rd floor

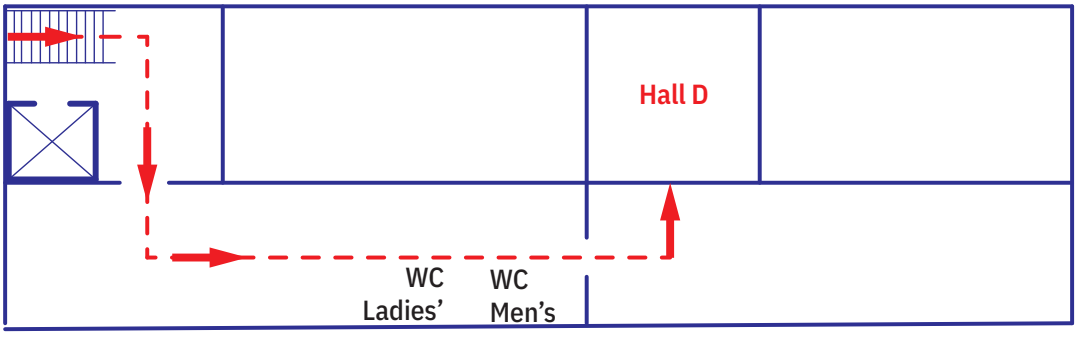


Building "A"

2nd floor



4th floor



TOPICS

- Plenary lectures
- Section A. Spintronics and magnetic nanostructures
- Section B. Spin dynamics and magnetic resonances
- Section C. Low dimensional magnetism
- Section D. Domain walls, vortices and skyrmions
- Section E. Magnetotransport, magnetooptics and magnetophotonics
- Section F. Magnetoelastic, magnetocaloric and shape memory effects
- Section G. Frustrated and disordered magnetism
- Section H. Magnetism of strongly correlated electron systems
- Section I. Magnetism and superconductivity
- Section J. Soft and hard magnetic materials
- Section K. Magnetic semiconductors, multiferroics, topological insulators
- Section L. Magnetic soft matter
- Section M. Magnetism in biology and medicine
- Section N. Magnetic non-destructive testing
- Round table Modern equipments and methods

PROGRAM

PROGRAM

Sunday, 08.09.2019, «Ural» Center

Time	*Main Hall*
12:00	**Registration**
16:00	**Opening Ceremony**
16:30	*Pl.1* **Sang-Wook CHEONG** Chirality, helicity, spirality and Moire patterns in intercalated transition metal dichalcogenides
17:10	*Pl.2* **Gen TATARA** Spintronics theory without spin current
18:00	**Welcome party**

Monday, 09.09.2019

Time	*Hall A*
9:30	*Pl.3* **Oleg TRETIAKOV** Spintronics with (anti)skyrmions and bimerons
10:10	*Pl.4* **Alexey KIMEL** Anomalies of spin dynamics in ferrimagnets
10:50	**Coffee break**

	Hall A ***Section A***	*Hall B* ***Section L***	*Hall C* ***Section J***	*Hall D* ***Section H***	*Hall E*
11:20	*A.I1* **Vladimir USTINOV** Electron spin currents and spin-dependent galvanomagnetic phenomena in metals	*L.I1* **Antonio MARTINS FIGUEIREDO NETO** Nonlinear optical properties of nanoparticles magnetic colloids	*J.I1* **Raghavan GOPALAN** Microstructure-microchemistry-magnetic properties in derivative Sm-Co magnets	*H.I1* **Sergei OVCHINNIKOV** Exchange interaction between excited states of magnetic ions	
11:50	*A.O1* **Götz SEIBOLD** Theory of spin-charge conversion at oxide interfaces: the inverse spin-galvanic effect	*L.I2* **Jānis CIMURS** Magnetic particle rotation driven non-equilibrium systems	*J.I2* **Dmitry BALAEV** Unusualmagnetic behavior of polymorph iron oxide ϵ-Fe_2O_3 nanoparticles: magnetic phase diagram and surface effects	*H.I2* **Kliment KUGEL** Half metallic states in doped density-wave insulators	
12:05	*A.O2* **Dmitry KHOLIN** Influence of interlayer exchange coupling on hysteresis loops of Fe/Cr/Gd superlattices				

12:20	*A.O3* **Mikhail MILYAEV** Functional GMR multilayers based on ternary ferromagnetic alloys CoFeNi	*L.O1* **Oleg STOLBOV** Instability of a chain of magnetically soft particles embedded in elastomer under a compressing load	*J.I3* **Michael FARLE** Shell ferromagnetism: materials with quasi magnetic monopole characteristics	*H.O1* **Petr IGOSHEV** Metal-insulator transition in the antiferromagnetic state of the Hubbard model: analytical theory	
12:35	*A.O4* **Mikhail DOROKHIN** Structures of semicon-ductor spintronics, formed by the combined method of MOCVD epitaxy and pulsed laser deposition	*L.O2* **Alexander SAFRONOV** Magnetostriction in ferrogels with embedded strontium hexaferrite particles		*H.O2* **Denis GORBUNOV** Magnetoelastic coupling across the field-induced transition of uranium mononitride	
12:50	**Lunch time**				
14:30	*A.I2* **Hyunsoo YANG** Spin-orbit technologies: from magnetic memory to terahertz generation	*L.I3* **Olivier SANDRE** Superparamagnetic iron oxide nanoparticles embedded in anisotropic polyion complex struc-tures	*J.I4* **Alexander ANDREEV** Influence of Co substi-tution in Fe sublattice on magnetism of RFe$_5$Al$_7$ intermetallics	*H.I3* **Oleg SUSHKOV** Hourglass magnetic dispersion and nature of the spin liquid phase in cuprates	
15:00	*A.O5* **Oksana KOPLAK** Nanoengineering of the surface of GdFeCo/IrMn structures by ultra short laser impulses	*L.I4* **Andrey ZUBAREV** Theoretical approach to the magnetic hyperthermia	*J.I5* **Nikolai PEROV** Amorphous soft magnetic metallic alloys. Advantages and perspectives	*H.I4* **Artem SBOYCHAKOV** Many-body effects and magnetism in twisted bilayer graphene	
15:15	*A.O6* **Vladimir POPOV** NMR studies of interlayer boundaries in Co/Cu superlattices				

15:30	*A.O7* **Nikolay BEBENIN** Spin polarization of electric current in magnetic superlattice	*L.I5* **Dirk ROMEIS** Microscopic approaches to mechanical response of magneto-sensitive elastomers	*J.O1* **Alexander VETCHER** Magnetic properties of special low-frequency soft magnetic composite material	*H.I5* **Arti KASHYAP** Understanding magnetism in Mn-based systems	
15:45	*A.O8* **Anton TARASOV** Transport properties of spintronic devices fabricated from ferromagnet/silicon hybrid structures		*J.O2* **Evgenii GOLYGIN** Influence of temperature on the ΔE-effect of amorphous Fe-based metal ribbons after both thermomagnetic and acid treatment		
16:00	*A.O9* **Igor LYAPILIN** Mechanism of electron spin relaxation in spiral magnetic structures	*L.I6* **Philip CAMP** Dynamic magnetic properties of ferrofluids	*J.O3* **Nataliya KAZANTSEVA** Magnetic properties and structure of products from steel 1.4540 manufactured by 3D printing	*H.O3* **Sergey DEMISHEV** Localized magnetic moments, magnetic transition and time reversal symmetry breaking in topological Kondo insulator SmB_6	
16:15	*A.O10* **Vyacheslav MARCHENKOV** Peculiarities of electronic transport and magnetic state in half-metallic and spin gapless semiconducting Heusler alloys		*J.O4* **Vladimir POPOV Jr.** Experimental study of NdFeB-based permanent magnets additively manufactured by electron beam melting	*H.O4* **Natalia KAZAK** Electronic and magnetic states of the Co and Fe in ludwigite system $Co_{3-x}Fe_xBO_5$	

16:30	*A.O11* **Vladimir GOLYASHOV** Spin polarized states and spin dependent effects in PbSnTe topological crystalline insulator	*L.O3* **Maria BALASOIU** Correlation effects in silicone-rubber magnetic elastomers investigated by small-angle neutron scattering method	*J.O5* **Aleksey VOLEGOV** Processes of magnetization reversal in nanocrystalline hard magnetic materials	*H.O5* **Alexei BELIK** Unusual magnetic properties and spin structures in quadruple and simple exotic perovskites	
16.45		*L.O4* **Milan TIMKO** Dielectric and rheological properties of an insulating magnetic fluid containing iron oxide nanoparticles	*J.O6* **Irina MINKOVA** Phase composition and morphology of the pow ders synthesized from boron nitride and iron by mechanical alloying	*H.O6* **Andrey KATANIN** Quantum critical behavior of correlated fermionic systems beyond Hertz-Moriya-Millís theory	
17:00		*L.O5* **Arthur ZAKINYAN** Rheology of ferrofluid emulsions: effect of droplets deformation	*J.O7* **Galina KURLYANDSKAYA** Magnetic materials for thin film based magnetoimpedance biosensing	*H.O7* **Alexey LUKOYANOV** Electronic structure and magnetic phase diagram of Gd_5Sb_3	
17.15	**Coffee break**				
17:30	**Poster session:**				
	Spintronics and magnetic nanostructures (Poster area I.A)				
	Magnetic soft matter (Poster area I.B)				
	Soft and hard magnetic materials (Poster area III.A)				
	Magnetism of strongly correlated electron systems (Poster area III.B)				

Tuesday, 10.09.2019

	Hall A ***Section A***	*Hall B* ***Section M***	*Hall C* ***Section B***	*Hall D* ***Section H***	*Hall E*
9:30	*A.I3* **Aleksandr CHUMAKOV** Towards nano-scale magnetism	*M.I1* **Felix BLYAKHMAN** Magnetic nanoparticles as a strong contributor to the ferrogel biocompatibility	*B.I1* **Dirk GRUNDLER** Artificial crystals and quasicrystals for nanomagnonics based on ferro- and ferrimagnetic nanostructures	*H.I6* **Sergey NIKITOV** Quantum fluctuations in magnetic nanostructures	
10:00	*A.O12* **Andrey SVALOV** Thickness dependence of magnetic properties of Tb-Co/Ti and Tb-Co/Si multilayers	*M.I2* **Karsten KUEPPER** Optical, electronic and magnetic properties of highly Mn-doped β-$NaGdF_4$ and β-$NaEu_4$ nanoparticles with narrow size distribution	*B.I2* **David SZALLER** Switchable one-way transparency via coupled magnetic and electric resonances	*H.I7* **Valentin IRKHIN** Giant density of states van Hove singularities and magnetism in cubic lattices	
10:15	*A.O13* **Artur USEINOV** Direct tunneling and related TMR anomalies in magnetic tunnel junctions with embedded nanoparticles				
10:30	*A.O14* **Ricardo LOPEZ ANTON** Structural and magnetic properties of Py/Ti multilayers	*M.O1* **Sergey LYASCHENKO** Synthesis and properties of Fe-Si magnetic nanoparticles for biomedical applications	*B.O1* **Lenar TAGIROV** Interlayer coupling in ultrathin epitaxial CoO/Co/Ag/Fe/MgO heterostructures	*H.O8* **Elena KOKORINA** $GdFe_2$ laves phase under pressure: *ab initio* calculations	

10:45	*A.O15* **Takafumi MIYANAGA** Local magnetic study for cluster-layered Fe/Cr nanostructures	*M.O2* **Artem MININ** Iron-core carbon-shell nanoparticles for biology and medicine	*B.O2* **Vasiliy GLAZKOV** Magnetic resonance in a quasy-2D antiferro-magnet $Ba_2MnGe_2O_7$	*H.O9* **Alexandra VYAZOVSKAYA** The origin and spin split-ting of two-dimensional electronic states at surfa-ces of the $GdRh_2Si_2(001)$	
11:00	**Coffee break**				
	Hall A ***Section F***	*Hall B* ***Section M***	*Hall C* ***Section B***	*Hall D* ***Section H***	*Hall A* ***Section L***
11:30	*F.I1* **Joerg NEUGEBAUER** *Ab initio* description of coupling phenomena between magnetic and structural degrees of freedom	*M.O3* **Grigory MELNIKOV** Designing magnetic matrices for cell technology supporting devices	*B.O3* **Konstantin MIKHALEV** NMR study of magnetic nanoparticles Ni@C	*H.I8* **Philippe BOURGES** Magnetism in spin-orbit coupled iridates	*L.I7* **Sofia KANTOROVICH** Magnetic microgels
11:45		*M.O4* **Danil BUKHVALOV** Electron correlations in Coordination metal complexes prospective for biomedical materials	*B.O4* **Leonid LUTSEV** Spin waves in nanosized YIG films: towards low relaxation and desirable magnetic profile		
12:00	*F.O1* **Akhmed ALIEV** Magnetocaloric effect in weak magnetic fields: Gd and Ni-Mn-In alloy	*M.O5* **Aleksandr KAMZIN** Core/shell magnetic nano particles for biomedical applications: synthesis and Mössbauer studies	*B.O5* **Natalia POLZIKOVA** YIG thickness influence on resonant magneto-elastic spin pumping	*H.I9* **Vasiliy BUCHELNIKOV** Correlation effect on the ground state pro-perties of Heusler alloys	*L.I8* **Peter KOPCANSKY** Magnetically anisotropic systems based on liquid crystals and magnetic fluids
12:15	*F.O2* **Adler GAMZATOV** Dynamic magnetocaloric effect in the $Ni_{50}Mn_{37-x}Al_xSn_{13}$ (x=2, 4, 6, 8) ribbon samples		*B.O6* **Denis TSIKALOV** Spin-wave resonance in gradient ferromagnets with a parabolic barrier of magnetic parameters		

12:30	*F.O3* **Elvina DILMIEVA** Magnetic induced martensitic transition in Heusler alloys in high magnetic fields		*B.O7* **Michael BORICH** Degenerated nuclear magnetostatic modes in ferromagnets	*H.O10* **Natalia ORLOVA** A new quantum model of the spin sublattices: problems and prospects	*L.I9* **Stefan ODENBACH** Microstructure analysis in magnetorheological elastomers — a path towards a scale-bridging understanding of magnetic hybrid materials
12:45	*F.O4* **Irina TERESHINA** Investigation of the combined effect of interstitial and substitutional atoms on the magnetic properties of the 4*f* – 3*d* intermetallics		*B.O8* **Alexey SEMENO** Antiferromagnetic resonance in GdB_6	*H.O11* **Andrey MIKHEYENKOV** Ultracold atoms with additional degree of freedom. Spin-orbital view	
13:00	**Lunch time**				
	Hall A ***Section F***	*Hall B* ***Round table***	*Hall C* ***Section B***	*Hall D* ***Section H***	*Hall A* ***Section L***
15:00	*F.I2* **Yurii KOSHKID'KO** Magnetocaloric effect of ferromagnetic Heusler alloys in high magnetic fields	*RT.1* **Alexey ERMAKOV** European XFEL: the study of matter deep inside. Metallurgical lab as an instrument for quality control and SRF material investigation	*B.I3* **Yury BUNKOV** Spin superfluidity at room temperature	*H.I10* **Daniel KHOMSKII** "Molecules" in solids against magnetism	*L.I10* **Yuriy RAIKHER** Magnetization of elastically trapped particles consisting of Stoner-Wohlfarth grains

15:30	*F.O5* **Igor NEKRASOV** Magnetocaloric effect in metallic strongly correlated systems with van Hove singularities	*RT.2* **Nikolai KISELEV** Off-axis electron holography for quantitative measurements of magnetic textures	*B.O9* **Natalia OSTROVSKAYA** Qualitative theory of dynamical systems for control of magnetic memory elements	*H.I11* **Ernst BAUER** Weak ferromagnetism of stoichiometric and off-stoichiometric Fe_2VAl based full Heusler systems	*L.I11* **Jeyadevan BALACHANDRAN** Shape and size-dependent magnetic behavior of magnetite nanoparticles in interaction-free system
15:45	*F.O6* **Kavita SRIKANTI** Magnetocaloric effect and huge adiabatic temperature change in $Mn_{1.15}Fe_{0.85}P_{0.65}Si_{0.13}Ge_{0.2}B_{0.02}$ alloy prepared by spark plasma sintering		*B.O10* **Alexandr SADOVNIKOV** Lateral and vertical spin-wave transport in magnonic networks		
16:00	*F.O7* **Abdulkarim AMIROV** Multicaloric effects in magnetoelectric composites	*RT.3* **Yury BUGOSLAVSKY** Magnetic fields, low temperatures and physical measurements: an overview of methods used in cryogenic equipment	*B.O11* **Nikolai KHOKHLOV** Optically-excited magnetostatic waves in a thin epitaxial galfenol film driven by ultrafast anisotropy changes	*H.I12* **Tanusri SAHA-DASGUPTA** Interplay of alternation and further neighbor interaction in S=1/2 spin chains: A case study of $Cs_2CuAl_4O_8$	*L.O6* **Andrey KUZNETSOV** Zero-field and field-induced interactions between multicore magnetic nanoparticles
16:15	*F.O8* **Mutta VASUNDHARA** Fe_3Al revisited; enhanced magnetocaloric effect and critical magnetic behavior		*B.O12* **Alexey DROVOSEKOV** Ferromagnetic resonance studies of Fe/Pd/Gd/Pd ferrimagnetic superlattices		*L.O7* **Segun GOH** A density functional approach to ferrogels: magnetostrictions and elastic constants
16:30	*F.O9* **Nikolai MELNIKOV** Effect of lattice vibrations on magnetic properties of metals at finite temperatures	*RT.4* **Andrey OMIROV** Scientific equipment for research laboratories	*B.O13* **Olga BABANOVA** NMR study of atomic motion in $NaB_{11}H_{14}$ and Na-7-$CB_{10}H_{13}$	*H.O12* **Sergey BRENER** Effective Heisenberg model and exchange interaction for strongly correlated systems	

16:45	*F.O10* **Sergey SHEVYRTALOV** Internal stresses influence on functional properties of Ni-Mn-Ga Heusler-type microwires	*RT.5* **Yury VYSOKIKH** Modern AFM techniques for magnetic domain structure investigation	*B.O14* **Yury FILIMONOV** Spin waves in YIG-based networks: logic and signal processing	*H.O13* **Vladimir ZVEREV** The magnetic moments of Rh in FeRh alloys	
17:00				*H.O14* **Alexander ULYANOV** Self-doped $Pr_{1-x}MnO_{3+\delta}$ manganites. XANES and EXAFS study	
17.15	**Coffee break**				
17:30	**Poster session:**				
	Spin dynamics and magnetic resonances (Poster area III.A)				
	Magnetoelastic, magnetocaloric and shape memory effects (Poster area I.B)				
	Magnetism in biology and medicine (Poster area III.B)				
	Magnetic semiconductors, multiferroics, topological insulators (Poster area I.A)				
	Magnetic non-destructive testing (Poster area III.B)				

Wednesday, 11.09.2019

Time	*Hall A*
9:30	*Pl.5* **Andrei ROGALEV** X-ray magnetic circular dichroism: recent advances
10:10	*Pl.6* **Theo RASING** All optical magnetic switching and brain-inspired concepts for low energy information processing
10:50	**Coffee break**

	Hall A ***Section C***	*Hall B* ***Section G***	*Hall C* ***Section I***	*Hall D*	*Hall E*
11:20	*C.I1* **Reinhard KREMER** Frustrated *J1 – J2* quantum spin chains	*G.I1* **Felix KASSAN-OGLY** Phase transitions and critical phenomena in frustrated systems	*I.I1* **Maxim KORSHUNOV** Magnetic interactions, superconductivity, and spin-resonance peak in iron-based materials		
11:50	*C.I2* **Olga VOLKOVA** Magnetoelectric effects in low dimensional systems	*G.I2* **Leonid SVISTOV** Search for nematic phases in frustrated magnets	*I.O1* **Anatoly SLOBODCHIKOV** Influence of orthorhombic deformations in CuO_2 plane on the electronic structure of high-T_C cuprate family		
12:05			*I.O2* **Yury PANOV** Critical temperatures of a model cuprate		

12:20	*C.O1* **Evgeniia KOMLEVA** Competition between the spin-orbit coupling and molecular orbitals in $Ba_4NbX_3O_{12}$ (X=Mn, Rh, Ir)	*G.I3* **Joachim WOSNITZA** Frustrated and low-dimensional magnetic materials in high magnetic fields	*I.O3* **Andrey KAMASHEV** Superconducting spin-valve effect in a heterostructures containing the Heusler alloy as ferromagnetic layers		
12:35	*C.O2* **Alexander KURBAKOV** Neutron scattering studies of the low-dimensional magnetism in the honeycomb layered $Na_2Ni_2TeO_6$ compound				
12:50	**Lunch time**				
15:00	**Excursions**				
19:00	**Symposium dinner**				

Thursday, 12.09.2019

Time	*Hall A*
9:30	*Pl.7* **Ramamoorthy RAMESH** Electric field control of magnetism for ultralow power electronics
10:10	**Break**

	Hall A ***Section C***	*Hall B* ***Section E***	*Hall C* ***Section I***	*Hall D* ***Section D***	*Hall E*
10:15	*C.I3* **Markus BRADEN** Magnetism in the layered ruthenates $Ca_{2-x}Sr_xRuO_4$	*E.I1* **Roman PISAREV** Unconventional optical and magneto-optical phenomena in the magnetoelectric antiferromagnet CuB_2O_4	*I.I2* **Alexander MELNIKOV** Electromagnetic proximity effect in planar superconductor-ferromagnet structures	*D.I1* **Alexander SAMARDAK** Skyrmions and skyrmion lattice in ultrathin "heavy metal/ferromagnet" films	
10:45	*C.I4* **Vladislav KATAEV** Unusual magnetic continuum in the proximate spin liquid compound α-$RuCl_3$	*E.I2* **Vladimir BELOTELOV** Magnetophotonic structures for ultrafast optical control of spins	*I.I3* **Ludmila USPENSKAYA** Edelshtein and Dresselhaus effects in magnetic dielectric/superconductor structure	*D.O1* **Alexey OGNEV** Simultaneous control of PMA and iDMI by focused ion beam irradiation in magnetic thin films	
11:00				*D.O2* **Roman MORGUNOV** Spontaneous quasiperiodical magnetization reversal in spin valves with perpendicular anisotropy	
11:15	**Coffee break**				

	Hall A ***Section C***	*Hall B* ***Section E***	*Hall C* ***Section I***	*Hall D* ***Section D***	*Hall E* ***Section K***
11:45	*C.I5* **Arseny SYROMYATNIKOV** Bond-operator formalism for discussion of exotic phases and elementary excitations in spin-1/2 magnets	*E.I3* **Vladimir GLUSHKOV** Anomalous Hall effect in the magnets with strong spin fluctuations	*I.I4* **Alexander MOSKVIN** Large variety of the on-site order parameters and phase states in quasi-2D HTSC cuprates	*D.I2* **Levente RÓZSA** Damping of spin wave modes in magnetic skyrmions	*K.I1* **Holger MEYERHEIM** Magnetism, electronic and geometric structure of ultra-thin transition metal dichalcogenides prepared by interface reaction with Bi_2Se_3
12:15	*C.I6* **Takanori SUGIMOTO** Cluster-based haldane states in quantum spin cluster chains	*E.O1* **Ivan KARPOVSKY** Ultrafast laser-driven spin-reorientation transition in a magnetite Fe_3O_4	*I.O4* **Vadim SHESTAKOV** Influence of temperature on the impurity-induced $s+-\rightarrow s++$ transition in the multiband model of Fe-based superconductors	*D.I3* **Alexander PYATAKOV** Electric field as an actor in micromagnetism	*K.I2* **Mikhail OTROKOV** Antiferromagnetic topological insulators: prediction from first principles, observation, and applications
12:30		*E.O2* **Andrey TELEGIN** Strain-magneto-optics: new magneto-optical phenomena associated with magnetoelastic interactions	*I.O5* **Elena POPOVA** Formation and structure of Nb_3Sn layers in bronze-processed superconductors under various intermediate heat treatments		

12:45	*C.O3* **Alexander OVCHINNIKOV** Anomalous temperature behavior of the chiral spin helix in $CrNb_3S_6$ thin lamellae	*E.O3* **Vladimir GREBENNIKOV** Effect of atomic magnetic moments in resonant X-ray photoemission spectroscopy	*I.O6* **Yury KHAYDUKOV** Magnetic proximity effect in Nb/Gd superlattices	*D.I4* **Rudolf SCHAEFER** Imaging of magnetic domain dynamics at power frequency	*K.I3* **Zoya KUN'KOVA** Magneto-optical detection of intrinsic ferromagnetism and phase separation in diluted magnetic semiconductors
13:00	*C.O4* **Dmitry DZEBISASHVILI** Quantum oscillations of magnetization in antiferromagnetic semimetals on a triangular lattice	*E.O4* **Tatyana MIKHAILOVA** Hybrid states of Tamm plasmon polaritons in nanostructures with Bi-substituted iron garnets	*I.O7* **Anton ZLOTNIKOV** Spin-charge fluctuations in the topologically nontrivial coexistence phase of superconductivity and magnetic ordering		
13:15	**Lunch time**				
15:00	*C.I7* **Alexander LICHTENSTEIN** Strong electronic correlations in low dimensional magnetic systems	*E.O5* **Lev AGAFONOV** Three-dimensional magneto-optical imaging of magnetic domain structures in iron garnets single crystals by means of confocal Raman microscopy	*I.I5* **Yuri SKRYABIN** Orbital magnetic correlations, topological order and superconductivity in strongly correlated systems	*D.I5* **Nikolai KISELEV** 2D And 3D magnetic textures with particle-like properties	*K.I4* **Zukhra GAREEVA** Cycloidal ordering in multiferroic films
15:15		*E.O6* **Michael YAKUSHEV** The g-factor of the topological insulator $BiSbTe_2S$: a magneto-optical study			

15:30	*C.I8* **Marina POPOVA** New low-dimensional magnetics of the langasite family	*E.O7* **Evgeny MASHKOVICH** THz opto-magnetism: non-linear excitation of spin waves in antiferromagnetic $FeBO_3$	*I.O8* **Nataliya PUGACH** Superconducting spin valves based on spiral magnets	*D.I6* **Michael FOERSTER** Field- and current-driven domain wall dynamics in cylindrical nanowires	*K.O1* **Oleg UDALOV** Magneto-electric effect in granular multiferroics
15:45		*E.O8* **Viktor PAVLOV** High-resolution optical second-harmonic spectroscopy in antiferromagnets accessed by femtosecond laser technique	*I.O9* **Irina BOBKOVA** Magnetoelectric effects in S/F and S/AF hybrids and Josephson detection of magnetization dynamics		*K.O2* **Lukas WEYMANN** Magnetic structure and magnetoelectricity in holmium-doped langasite
16:00	*C.I9* **Anatoly YERMAKOV** Dimerization and low-dimensional magnetism of nanocrystalline magnetic semiconductors TiO_2 doped by Fe and Co	*E.O9* **Evgeny KARASHTIN** Theory of linear optical effect in magnetic media with Dzyaloshinskii-Moriya interaction	*I.O10* **Lev MAZOV** The key role of AF SDW state for HTSC in cuprates and pnictides	*D.O3* **Aleksandr DAVYDENKO** Magnetic structure of [Co(0.8–1.6nm)/Pd(2nm)]5 superlattices with interfacial Dzyaloshinskii-Moriya interaction	*K.O3* **Anatolii PANKRATS** Magnetic and thermodynamic properties and spin-flop-driven magnetodielectric response of the antiferromagnetic $Pb_2Fe_2Ge_2O_9$ single crystals
16:15		*E.O10* **Mikhail ZHURAVLEV** New mechanism for linear and non-linear Faraday and Kerr magnetooptic effects	*I.O11* **Evgueni TALANTSEV** Classifying superconductivity in magic angle twisted bilayer graphene	*D.O4* **Mikhail LOGUNOV** Thermal and non-thermal effects in laser-induced inertial domain-wall dynamics	*K.O4* **Jan GOSPODARIC** Band structure of the 3D HgTe quantum well from the cyclotron resonance
16:30	*C.O5* **Aleksandr PETROV** Size-effect's influence on the magnetic phase transition in the nanomagnetics	*E.O11* **Tatyana KUZNETSOVA** X-ray magnetic circular dichroism on the $N_{4,5}$ edges in rare earth ferromagnets	*I.O12* **Airat KIIAMOV** Mössbauer spectroscopy study of the magnetic microstructure of $Fe_{1.05}Te_{1-x}Se_x$	*D.O5* **Anton RASKOVALOV** Solitons in the domain structure of an easy-axis ferromagnet	*K.O5* **Sergey APLESNIN** Magnetoresistance and magnetoimpedance in $Lu_xMn_{1-x}S$ solid solutions paramagnetic state

16:45	*C.O6* **Kira VOSTRIKOVA** Cyanometallates in design of low-dimensional molecular magnets: promises and disadvantages	*E.O12* **Irina KOLMYCHEK** Nonlinear magneto-optical effects in planar structures based on heavy and ferromagnetic metals		*D.O6* **Ksenia CHICHAY** Effect of interplay of Dzyaloshinskii-Moriya and dipolar interactions on internal skyrmion structure in magnetic multilayers	*K.O6* **Vladimir MEN'SHENIN** Magnetic phase transitions and electric polarization in RMn_2O_5 oxides
17:00	*C.O7* **Marina ANDREEVA** Polarization selection in Mössbauer reflectivity for magnetic multilayer investigation				
17.15	**Coffee break**				
17:30	**Poster session:**				
	Low dimensional magnetism (Poster area III.A)				
	Domain walls, vortices and skyrmions (Poster area I.A)				
	Magnetotransport, magnetooptics and magnetophotonics (Poster area I.B)				
	Frustrated and disordered magnetism (Poster area I.A)				
	Magnetism and superconductivity (Poster area III.B)				

Friday, 13.09.2019

	Hall A **Section C**	*Hall B* **Section G**	*Hall C* **Section K**	*Hall C* **Section J**	*Hall C* **Section N**
9:30	*C.I10* **Daniel BÜRGLER** Quantum interference effects in molecular spin hybrids	*G.I4* **Peter PRELOVSEK** Spin liquid state in planar Heisenberg models	*K.I4* **Yuri FETISOV** Nonlinear magnetoelectric effects in layered ferromagnetic-piezoelectric structures	*J.I6* **Arcady ZHUKOV** Stress- induced magnetic anisotropy enabling engineering of magnetic softness GMI effect and domain wall dynamics of amorphous microwires	*N.I1* **Sergey ZADVORKIN** Magnetic structural analysis of constructional materials and products
10:00	*C.O8* **Iuliia NOVOSELOVA** MAX phases as a novel class of magnetic materials	*G.O1* **Felix KASSAN-OGLY** Ising model on planar decorated lattices. Frustrations and their affection on phase transitions	*K.I5* **Mikhail EREMIN** Magnetoelectric coupling in noncollinear ferrimagnets	*J.O8* **Nikolay MUSHNIKOV** Magnetic properties of non-stoichiometric *4f-3d* intermetallics	*N.O1* **Evgeny SERBIN** Complex application of magnetic and magnetoacoustic parameters in the structuroscopy of ferromagnetic materials
10:15	*C.O9* **Marina BOLDYREVA** Non-equilibrium critical behavior of multilayer magnetic nanostructures	*G.O2* **Alexander SMIRNOV** Competition of static and dynamic disorder in a triangular antiferromagnet $RbFe(MoO_4)_2$		*J.O9* **Aleksandr PIROGOV** Magnetic phase transition in $Tb_{0.9}Er_{0.1}Ni_5$	*N.O2* **Sergei SHCHERBININ** Magnetoimpedance-based low field detector prototype: focus on biomedical conditions
10:30	*C.O10* **Pavel PRUDNIKOV** Aging and hysteresis effects in critical behavior of multilayer magnetic nanostructures	*G.O3* **Svetlana SOFRONOVA** Heat capacity, structural and magnetic properties of mixed-valence $Pb_3(Mn,Cu)_7O_{15}$	*K.O7* **Svetlana EFREMOVA** Observation of the inverse magnetoelectric effect in PZT/Finemet two-layered composite structures	*J.O10* **Alexander ERMOLENKO** Compositional genesis of paramagnetism–ferromagnetism transition in $PrNi_{(2-x)}Co_{(x)}$ alloys	*N.O3* **Alexey MIKHAYLOV** Highly effective system for excitation and reception of Lamb waves in ferromagnets

10:45	*C.O11* **Vladimir GORNAKOV** Perpendicular exchange bias in the "ferrimagnetic/ antiferromagnetic" heterostructure	*G.O4* **Andrei GUBKIN** Field-induced magnetic phase transitions and metastable states in Tb_3Ni	*K.O8* **Alexander MUKHIN** Effect of electric field on magnetization and magnetic susceptibility in rare-earth ferroborite multiferroics	*J.O11* **Nadezhda KOSTYUCHENKO** High-field magnetization of the $ErFe_{11}Ti$ intermetallic with low rare-earth content	*N.O4* **Andrey NIKITIN** Identification of defects in a ferromagnet by solving the inverse problem of magnetostatics
11:00	*C.O12* **Maksim SAPOZHNIKOV** Magnetic resonance force microscopy of ferromagnetic nanostructures	*G.O5* **Evgeniia VAVILOVA** Magnetic ordering process and phase diagram of a honeycomb lattice compound $InCu_{2/3}V_{1/3}O_3$ via magnetoresonance technique study	*K.O9* **Vladimir GUDKOV** Jahn-Teller effect in acoustic properties of titanium doped $BaFe_{12}O_{19}$ hexaferrite single crystals	*J.O12* **Oksana GOLOVNIA** Magnetic properties and structure of melt-spun Fe-Pd-P	*N.O5* **Yuri REUTOV** The reason of occurrence of a longitudinal residual induction steel core after circular magnetization
11.15	*C.O13* **Tobias POHLMANN** Cation-specific magnetic depth profiles in ultrathin Fe_3O_4 films obtained by XRMR	*G.O6* **Artyom VAULIN** Investigation of incommensurate magnetic structure of Ho_7Rh_3 using superspace formalism	*K.O10* **Guolei LIU** Ferroelectric polarization controlled anomalous Hall effects and magnetoresistance in ferromagnetic semiconductors (Zn, Co)O		*N.O6* **Anastasia NOVOSLUGINA** Main features of distributions of the magnetic flux leakage fields of defects different shapes
11:30	*C.O14* **Nikita KULESH** Hysteresis properties and perpendicular magnetic anisotropy in GdCo films with hexagonal antidot lattice		*K.O11* **Alexander EDSTRÖM** Giant magnetoelectric response and cross-caloric effect around a tetracritical point in multiferroic $SrMnO_3$		*N.O7* **Alexey STASHKOV** Magnetic control of residual stresses in low carbon steels
11:45	**Coffee break**				
12:30	**Closing ceremony**				

ORAL SESSIONS

SUNDAY, 08.09.2019

Sunday, 08.09.2019, «Ural» Center

12:00 **Registration**

16:00 **Opening Ceremony**

PLENARY LECTURES, Main Hall

Chairperson: Vladimir USTINOV

16:30 *Sang-Wook CHEONG*
Pl.1 **CHIRALITY, HELICITY, SPIRALITY AND MOIRE PATTERNS IN INTERCALATED TRANSITION METAL DICHALCOGENIDES**

Transition metal dichalcogenides (TMDs) have been extensively investigated as 2D materials last decade. We have explored a series of chiral $M_{1/3}Ta(Nb)S(Se)_2$ to investigate the correlation among chiral structure, magnetic helicity/spirality and their physical properties. These results as well as Moire patterns with self-twisted TMDs induced by intercalation will be discussed.

17:10 *Gen TATARA*
Pl.2 **SPINTRONICS THEORY WITHOUT SPIN CURRENT**

Linear response theory of spin-charge conversion effects in spintronics is presented in terms of correlation functions of physical observables, spin and electric current.

18:00 **Welcome party**

MONDAY, 09.09.2019

Monday, 09.09.2019

PLENARY LECTURES, Hall A

Chairperson: Nikolay MUSHNIKOV

9:30 *Oleg TRETIAKOV*
Pl.3 **SPINTRONICS WITH (ANTI)SKYRMIONS AND BIMERONS**

A magnetic bimeron is a pair of two merons and can be understood as the in-plane magnetized version of a skyrmion. We theoretically predict the existence of single magnetic bimerons as well as bimeron crystals, and compare the emergent electrodynamics of bimerons with their skyrmion analogues. I will show that bimeron crystals can be stabilized in frustrated magnets and will analyze what crystal structure can stabilize bimerons or bimeron crystals via the Dzyaloshinskii-Moriya interaction.

10:10 *Alexey KIMEL*
Pl.4 **ANOMALIES OF SPIN DYNAMICS IN FERRIMAGNETS**

Due to multi-sublattice nature as well as interplay between the spin-orbit and the exchange interaction, fundamental studies of spin dynamics in ferrimagnets often lead to unexpected and counter-intuitive results. Here we will discuss several examples of anomalous behavior of ferrimagnets such as triple hysteresis, slowdown of spin dynamics upon an increase of applied magnetic field and heat-induced magnetization reversal. Finally, we will demonstrate that femtosecond laser pulse can write magnetic bits in ferrimagnets in a nearly non-dissipative way, at the picosecond time scale and with the repetition rate up to 20 GHz.

10:50 **Coffee break**

Section A. Spintronics and magnetic nanostructures, Hall A

Chairperson: Oksana KOPLAK

11:20 *Vladimir USTINOV*
A.I1 **ELECTRON SPIN CURRENTS AND SPIN-DEPENDENT GALVANOMAGNETIC PHENOMENA IN METALS**

The basic equations describing spin currents and spin-dependent transport phenomena in metals in the presence of a non-uniform magnetic field are derived from ”first principles”. The results are used to describe the charge and spin transport of conduction electrons in metal helimagnets.

11:50 *Götz SEIBOLD*
A.O1 **THEORY OF SPIN-CHARGE CONVERSION AT OXIDE INTERFACES: THE INVERSE SPIN-GALVANIC EFFECT**

Recent experiments have demonstrated a strong inverse Edelstein effect at LaO/STO interfaces with a reported spin-to-charge efficiency more than one order of magnitude larger than in conventional metallic layers. In order to analyze this issue we calculate the inverse Edelstein effect within a multi-band model which involves the $3d\ t_{2g}$ bands of the Ti ions. Consistenly with experiment we find a sign change which depends on the occupation of the *xy* and *xz/yz* orbitals.

12:05 *Dmitry KHOLIN*
A.O2 **INFLUENCE OF INTERLAYER EXCHANGE COUPLING ON HYSTERESIS LOOPS OF Fe/Cr/Gd SUPERLATTICES**

In this work we test a new method based on Kerr magnetometry to study interlayer exchange coupling in [Fe(35Å)/Cr(tCr)/Gd(50Å)/Cr(tCr)]12 superlattices for tCr ranging from 4 to about 20 Å. We use the coercive force of Gd layers to fix the direction of Gd moments while switching the Fe magnetization using low magnetic fields. The interlayer coupling between Fe and Gd leads to the effect of unidirectional anisotropy in Fe layers, similar to exchange bias effect in FM/AFM systems.

12:20 *Mikhail MILYAEV*
A.O3 **FUNCTIONAL GMR MULTILAYERS BASED ON TERNARY FERROMAGNETIC ALLOYS CoFeNi**

$[FM(t_{FM})/Cu(2.2)]_n$ multilayers with four types of ferromagnetic alloys (FM = $Co_{90}Fe_{10}$, $Co_{85}Fe_{12}Ni_3$, $Co_{77}Fe_{17}Ni_6$, $Co_{70}Fe_{20}Ni_{10}$) are investigated. It has been established that maximal GMR ratio for optimized multilayers with different CoFeNi alloys achieves 30–31%. In comparison with $Co_{90}Fe_{10}$/Cu, the $Co_{70}Fe_{20}Ni_{10}$/Cu multilayer has twice more weakly hysteresis and in ~1.5 time the less field of magnetic saturation.

12:35 *Mikhail DOROKHIN*
A.O4 **STRUCTURES OF SEMICONDUCTOR SPINTRONICS FORMED BY THE COMBINED METHOD OF MOCVD EPITAXY AND PULSED LASER DEPOSITION**

This report describes the possibilities of a method for the formation of GaAs spintronics structures, consisting in the combined structures growth by MOCVD epitaxy and a pulsed laser deposition. The first method allows growing high-quality semiconductro structures whereas pulsed laser deposition is used for the fabrication of (Ga,Mn)As of (In,Fe)Sb diluted magnetic semiconductors. The properties of devices based on such structures are discussed.

12:50 **Lunch time**

Chairperson: Nikolay CHUMAKOV

14:30 *Hyunsoo YANG*
A.I2 **SPIN-ORBIT TECHNOLOGIES: FROM MAGNETIC MEMORY TO TERAHERTZ GENERATION**

This is an IEEE Distinguished Lecture for 2019. Over the last decade, spintronic research has focused largely on techniques based on spin-orbit coupling, such as spin-orbit torques (SOTs), to alter the magnetic state. I will introduce the basic concepts of SOTs, such as their physical origin, the effect of SOTs on a magnetic material, and how to quantitatively measure this effect. In addition, I will introduce the process of terahertz generation in magnetic heterostructures.

15:00 *Oksana KOPLAK*
A.O5 **NANOENGINEERING OF THE SURFACE OF GdFeCo/IrMn STRUCTURES BY ULTRA SHORT LASER IMPULSES**

Laser engineering of the surface of GdFeCo thin films opens new opportunities for local control of energy balance between magnetic anisotropy, exchange interaction and Zeeman energy. This can be used to create individual separated sectors on the surface of the magnetic films for capture, storage and analysis of the ferromagnetic nanoparticles and magnetically labeled biology cells.

15:15 *Vladimir POPOV*
A.O6 **NMR STUDIES OF INTERLAYER BOUNDARIES IN Co/Cu SUPERLATTICES**

15:30 *Nikolay BEBENIN*
A.O7 **SPIN POLARIZATION OF ELECTRIC CURRENT IN MAGNETIC SUPERLATTICE**

The spin polarization of electrons moving through a magnetic metallic superlattice consisting of alternating ferromagnetic and non-ferromagnetic layers is studied. The superlattice is treated as a paramagnetic metal in which the exchange field acting on itinerant electrons is embedded. Electric current flows perpendicular to the layers' plane (CPP geometry).

15:45 *Anton TARASOV*
A.O8 **TRANSPORT PROPERTIES OF SPINTRONIC DEVICES FABRICATED FROM FERROMAGNET/SILICON HYBRID STRUCTURES**

One of alternatives to conventional electronics is spintronics aiming at the use of the electron's spin in data operations in future devices. Here we report our recent results in area of micro- and nanodevice processing and transport properties studying in hybrid structures. In fabricated Fe_3Si/p–Si planar structure spin accumulation effect was found by 3–T Hanle technique. Bias-dependent negative magnetoresistance was observed during testing of prepared Fe/SOI nanowire transistor.

16:00 *Igor LYAPILIN*
A.O9 **MECHANISM OF ELECTRON SPIN RELAXATION IN SPIRAL MAGNETIC STRUCTURES**

Spin dynamics in spiral magnetic structures has been investigated. It has been shown that the internal spatially dependent magnetic field in such structures produces a new mechanism of spin relaxation.

16:15 *Vyacheslav MARCHENKOV*
A.O10 **PECULIARITIES OF ELECTRONIC TRANSPORT AND MAGNETIC STATE IN HALF-METALLIC AND SPIN GAPLESS SEMICONDUCTING HEUSLER ALLOYS**

Theoretical and experimental results on the electronic structure, electrical, magnetic and galvanomagnetic properties of X_2YZ Heusler alloys (X = Fe, Co, Mn; Y = Ti, V, Cr, Mn, Fe, Co, Ni; Z = Al, Si, Ga, Ge, In, Sn, Sb) are presented. To summarize, the peculiarities of the electron energy spectrum, leading to an appearance of HMF and SGS states, are the physical reason for the observed anomalies in the electronic and magnetic properties of Heusler alloys studied.

16:30 *Vladimir GOLYASHOV*
A.O11 **SPIN POLARIZED STATES AND SPIN DEPENDENT EFFECTS IN PbSnTe TOPOLOGICAL CRYSTALLINE INSULATOR**

Magnetoresistance of $Pb_{1-x}Sn_xTe$:In topological crystalline insulator films with Co and FeCoB ferromagnetic contacts is studied. Spin valve effect in local geometry with more than 50 μm distance between ferromagnetic contacts is observed. Spin resolved ARPES measuremets confirmed the existence of spin polarized linear dispersion surface states.

17:15 **Coffee break**

Section L. Magnetic soft matter, Hall B
Chairperson: Alexey IVANOV

11:20 *Antonio MARTINS FIGUEIREDO NETO*
L.I1 **NONLINEAR OPTICAL PROPERTIES OF NANOPARTICLES MAGNETIC COLLOIDS**

The first-order hyperpolarizability β of magnetite nanoparticles in colloidal dispersion was measured in the presence and absence of an external magnetic field by using the Hyper-Raileigh Scattering.

11:50 *Jānis CIMURS*
L.I2 **MAGNETIC PARTICLE ROTATION DRIVEN NON-EQUILIBRIUM SYSTEMS**

Dynamics of ensemble of magnetic particles in rotating field under action of magneticcohesion forces and lubrication forces.

12:20 *Oleg STOLBOV*
L.O1 **INSTABILITY OF A CHAIN OF MAGNETICALLY SOFT PARTICLES EMBEDDED IN ELASTOMER UNDER A COMPRESSING LOAD**

Soft magnetoactive elastomers (MAEs) are composites where the filler is made of microparticles of isotropic low-coercive ferromagnet, e.g., carbonyl iron. In this work we develop a qualitative concept that shades light on the mesoscopic effects which underlie some important features observed in the mechanical behavior of MAE.

12:35 *Alexander SAFRONOV*
L.O2 **MAGNETOSTRICTION IN FERROGELS WITH EMBEDDED STRONTIUM HEXAFERRITE PARTICLES**

The report presents the experimental data on the magnetostriction in the uniform magnetic field 400 mT for the ferrogels based on strontium hexaferrite particles embedded in polymeric networks of different structure. Ferrogels with physical networking, chemical networking, and combined physical/chemical networking have been studied.

12:50 **Lunch time**

Chairperson: Antonio MARTINS FIGUEIREDO NETO

14:30 *Olivier SANDRE*
L.I3 **SUPERPARAMAGNETIC IRON OXIDE NANOPARTICLES EMBEDDED IN ANISOTROPIC POLYION COMPLEX STRUCTURES**

This communication describes the use of a newly developed depolarized dynamic light scattering setup to study the growth kinetics of mixtures of negatively charged polymer-coated magnetic nanoparticles with oppositely charged polyelectrolytes, through a desalting method by dialysis under a static applied magnetic field. By varying conditions, magnetic filaments of different lengths and flexibilities were obtained, which can be imaged by fluorescence microscopy for future micromechanical studies.

15:00 *Andrey ZUBAREV*
L.I4 **THEORETICAL APPROACH TO THE MAGNETIC HYPERTHERMIA**

Magnetic hyperthermia is a perspective approach for treatment of oncological diseases. The main idea of this method is heating of the tumor cells by embedded ferromagnetic nanoparticles under the action of oscillating either rotating magnetic field. A theoretical study of magnetic hyperthermia, produced by ferromagnetic particles, frozen in a carrier medium, is presented. The main emphasis of the analysis is on the effects of magnetic interaction between the particles.

15:30 *Dirk ROMEIS*
L.I5 **MICROSCOPIC APPROACHES TO MECHANICAL RESPONSE OF MAGNETO-SENSITIVE ELASTOMERS**

We present an approximation scheme based on the dipole-dipole interaction model to analyze the interplay between macroscopic and microscopic properties determining the magneto-induced deformation behavior of magneto-sensitive elastomers. Considering some fundamental and limiting cases of the elastic coupling, we describe the effects of different particle rearrangement mechanisms on the macroscopic deformation behavior.

16:00 *Philip CAMP*
L.I6 **DYNAMIC MAGNETIC PROPERTIES OF FERROFLUIDS**

Using a combination of theory and simulation, the effects of material parameters on the frequency-dependent magnetic susceptibility are explored. In particular, it is shown that particle polydispersity and dipolar interactions have huge effects on both the strength and the frequency-dispersion of the magnetic response. The consequences for the analysis of experimental measurements are outlined.

16:30 *Maria BALASOIU*
L.O3 **CORRELATION EFFECTS IN SILICONE-RUBBER MAGNETIC ELASTOMERS INVESTIGATED BY SMALL-ANGLE NEUTRON SCATTERING METHOD**

In the present work, the small-angle neutron scattering (SANS) method is used for the investigation of structural and magnetic correlations of magnetic nanoparticles embedded in the elastomeric matrix. New structural information such as the average distance between particles, the dimension of the long-range order, and the degree of disorder parameter, are determined and analyzed using a specific combination of magnetic particles and silicone rubber matrices.

16:45 *Milan TIMKO*
L.O4 **DIELECTRIC AND RHEOLOGICAL PROPERTIES OF AN INSULATING MAGNETIC FLUID CONTAINING IRON OXIDE NANOPARTICLES**

This contribution is devoted to study of dielectric breakdown and viscosity in transformer oil based magnetic fluids which can be controlled by the concentration of magnetic nanoparticles, magnetic field and electric field too. In this paper we discuss dielectric conditions in magnetic fluids which can lead to effective nanoparticle polarization and subsequent electric dipole-dipole interaction.

17:00 *Arthur ZAKINYAN*
L.O5 **RHEOLOGY OF FERROFLUID EMULSIONS: EFFECT OF DROPLETS DEFORMATION**

The experimental, theoretical and computational study of effect of the dispersed drops deformation on the magnetoviscous effect in ferrofluid emulsions is presented.

17:15 **Coffee break**

Section J. Soft and hard magnetic materials, Hall C

Chairperson: Nikolai PEROV

11:20 *Gopalan RAGHAVAN*
J.I1 **MICROSTRUCTURE- MICROCHEMISTRY- MAGNETIC PROPERTIES IN DERIVATIVE Sm–Co MAGNETS**

3D atom probe analysis , magnetic properties and the microstructure of Sm-Co magnets will be presented in detail.

11:50 *Dmitry BALAEV*
J.I2 **UNUSUAL MAGNETIC BEHAVIOR OF POLYMORPH IRON OXIDE ϵ-Fe_2O_3 NANOPARTICLES: MAGNETIC PHASE DIAGRAM AND SURFACE EFFECTS**

The report will review both known results and the results obtained by our group on the study of the magnetic properties of a rare polymorphic modification of trivalent iron oxide ϵ-Fe_2O_3. Special attention will be paid to the low-temperature (4–80 K) magnetic state of ϵ-Fe_2O_3 and the high temperature ($\sim$850 K) of the transition of ϵ-Fe_2O_3 to the paramagnetic state.

12:20 *Michael FARLE*
J.I3 **SHELL FERROMAGNETISM: MATERIALS WITH QUASI MAGNETIC MONOPOLE CHARACTERISTICS**

Shell ferromagnetism results in a new phenomenon for bulk magnetism. In off-stoichiometric Heusler alloys superparamagnetic clusters with a ferromagnetic shell are formed in an antiferromagnetic matrix. This results in quasi-monopole behavior of a bulk ferromagnetic material.

12:50 **Lunch time**

Chairperson: Michael FARLE

14:30 *Alexander ANDREEV*
J.I4 **INFLUENCE OF Co SUBSTITUTION IN Fe SUBLATTICE ON MAGNETISM OF RFe_5Al_7 INTERMETALLICS**

Analogues of RFe_5Al_7 (R – heavy rare-earth metal) intermetallic compounds with Co instead of Fe do not exist. However, we found large solubility of Co in these compounds and studied influence of Co on magnetism in solid solutions with R = Dy, Ho, Tm.

15:00 *Nikolai PEROV*
J.I5 **AMORPHOUS SOFT MAGNETIC METALLIC ALLOYS. ADVANTAGES AND PERSPECTIVES**

The authors present an analysis of the further prospects for the use of amorphous soft magnetic metal alloys and present a comparison of the results of studies of the magnetic parameters of such alloys obtained by various methods. The mechanisms of structural changes under various types of effects are discussed - plastic deformation, quenching, and annealing. Sensors of various types based on amorphous soft magnetic metal alloys are considered.

15:30 *Alexander VETCHER*
J.O1 **MAGNETIC PROPERTIES OF SPECIAL LOW-FREQUENCY SOFT MAGNETIC COMPOSITE MATERIAL**

Progress in magnetic properties improving of composite materials and reducing of the remagnetization losses has been achieved in this work by using of various magnetic oxides as insulating coatings, where the thickness of iron particle coatings has been reduced to a fraction of nanometers.

15:45 *Evgenii GOLYGIN*
J.O2 **INFLUENCE OF TEMPERATURE ON THE ΔE-EFFECT OF AMORPHOUS Fe-BASED METAL RIBBONS AFTER BOTH FERROMAGNETIC AND ACID TREATMENT**

The processing of materials $Fe_{67}Co_{10}Cr_3Si_5B_{15}$ with HCl acid was carried out in order to make the surface of the samples more homogeneous and to study a number of properties. It was assumed that different length of treatment time will affect the composition of the ribbons. Treatment with hydrochloric acid was supposed to lead to the exit from the surface of the samples of Cr, as the most active metal in the composition of the ribbon.

16:00 *Nataliya KAZANTSEVA*
J.O3 **MAGNETIC PROPERTIES AND STRUCTURE OF PRODUCTS FROM STEEL 1.4540 MANUFACTURED BY 3D PRINTING**

Magnetic properties and structure of the 1.4540 steel products manufactured by additive technology used the selective laser melting method (SLM) were studied. The structure of the SLM alloy differs from the conventional 1.4540 steel. The volume fraction of austenite of 37% is found in the SLM sample. The martensitic thin plates and different precipitations are observed in both as-build and solutionized samples. The solution treatment at standard temperature of 1038 C can be successfully used for the SLM 1.4540 steel products. Magnetic properties of the SLM 1.4540 steel allow considering this material for soft-magnetic applications requiring high strength and high corrosion resistance.

16:15 *Vladimir POPOV Jr.*
J.O4 **EXPERIMENTAL STUDY OF NdFeB-BASED PERMANENT MAGNETS ADDITIVELY MANUFACTURED BY ELECTRON BEAM MELTING**

The goal of the current work is to demonstrate the possibility of manufacturing permanent magnets from gas atomized Nd-Fe-B powder using Electron Beam Melting (EBM). Nanostructured gas atomized Nd-Fe-B powder of the MQP-S type with a substoichiometric composition ($Nd_2Fe_{14}B$+α–Fe) was chosen as the starting material.

16:30 *Aleksey VOLEGOV*
J.O5 **PROCESSES OF MAGNETIZATION REVERSAL IN NANOCRYSTALLINE HARD MAGNETIC MATERIALS**

Thorough grasp of magnetization reversal processes in hard magnetic materials makes it possible to improve their magnetic properties by purposive tuning of technological processes during their production. Obtained results of the work allowed us to conclude that magnetization reversal in rapidly quenched alloys with intergrain exchange interaction is a combination of domain wall nucleation, pinning and irreversible magnetization rotation.

16:45 *Irina MINKOVA*
J.O6 **PHASE COMPOSITION AND MORPHOLOGY OF THE POWDERS SYNTHESIZED FROM BORON NITRIDE AND IRON BY MECHANICAL ALLOYING**

The report examines the issues of obtaining of hard magnetic materials of the system Fe–BN mechanical alloying method; and studied their structure and magnetic properties.

17:00 *Galina KURLYANDSKAYA*
J.O7 **MAGNETIC MATERIALS FOR THIN FILM BASED MAGNETOIMPEDANCE BIOSENSING**

Giant magnetoimpedance has the highest sensitivity to the external magnetic field. Here we describe our experience in design, fabrication and characterization of FeNi-based multilayered structures for biometric detector that operates at room temperature, with a sensitivity of the order of few nT. Automatic system based on a ZVA-67 (Rohde & Schwarz) vector circuit analyzer was built for one scan microwave absorption studies of both MI and ferromagnetic resonance.

17:15 **Coffee break**

Section H. Magnetism of strongly correlated electron systems, Hall D

Chairperson: Valentin IRKHIN

11:20 *Sergei OVCHINNIKOV*
H.I1 **EXCHANGE INTERACTION BETWEEN EXCITED STATES OF MAGNETIC IONS**

We consider here the effect of the cation excited states on the interatomic superexchange interaction. The exchange interaction below spin crossover in $FeBO_3$ is AFM and in low spin state at high pressure its sign changes to the ferromagnetic.

11:50 *Kliment KUGEL*
H.I2 **HALF-METALLIC STATES IN DOPED DENSITY-WAVE INSULATORS**

Half-metallicity (full spin polarization of the Fermi surface) usually occurs in strongly correlated electron systems. We demonstrate that doping a spin-density wave insulator (formed due to the nesting of electron and hole Fermi surface sheets) may also stabilize half-metallic states even in the weak-coupling limit. The properties of these states are discussed.

12:20 *Petr IGOSHEV*
H.O1 **METAL-INSULATOR TRANSITION IN THE ANTIFERROMAGNETIC STATE OF THE HUBBARD MODEL: ANALYTICAL THEORY**

The nature of the metal–insulator transition (MIT) is still not understood in detail. The transfer between the second neighbors can lead to the appearance of the AFM metallic phase which may be more energetically favorable than the paramagnetic metal. We treat the problem of the phase diagram of the ground state for the *tt* Hubbard model taking into account Van Hove singularities of electron spectrum. We obtain the MIT criterion within the framework of the analytic expansion in the transfer integral *t* and the direct AFM gap Δ.

12:35 *Denis GORBUNOV*
H.O2 **MAGNETOELASTIC COUPLING ACROSS THE FIELD-INDUCED TRANSITION OF URANIUM MONONITRIDE**

Uranium mononitride displays a spin-flop-like transition for magnetic field applied along all principal crystallographic directions just below 60 T. We found pronounced anomalies in the acoustic properties at the transition. A further anomaly observed at fields slightly above the transition is likely related to the formation of magnetic domains. A model based on the exchange-striction coupling mechanism well reproduces the strong renormalization of the acoustic properties.

12:50 **Lunch time**

Chairperson: Sergei OVCHINNIKOV

14:30 *Oleg SUSHKOV*
H.I3 **HOURGLASS MAGNETIC DISPERSION AND NATURE OF THE SPIN LIQUID PHASE IN CUPRATES**

We explain the hour-glass magnetic dispersion in underdoped cuprates and provide unified picture of the evolution of magnetic excitations in various cuprate families.

15:00 *Artem SBOYCHAKOV*
H.I4 **MANY-BODY EFFECTS AND MAGNETISM IN TWISTED BILAYER GRAPHENE**

We theoretically study effects of electron-electron interaction in twisted bilayer graphene. Two regimes were considered: (*i*) relatively large twist angles with electronic spectrum consisting of four Dirac cones inherited from each graphene layer and (*ii*) the so called 'first magic angle', where no Dirac cones exist near the Fermi level, and the bilayer's spectrum consists of weakly-dispersing partially degenerate bands.

15:30 *Arti KASHYAP*
H.I5 **UNDERSTANDING MAGNETISM IN Mn-BASED SYSTEMS**

The talk aims at presenting our research investigations on high-moment magnetic alloys based on Manganese. The main thrust of the research is on pinpointing the atomic positions and their effect on the net magnetization in Mn-based and Mn-doped alloys. We will present a data mining approach to evaluate the correlation of the Mn-neighborhood with the magnetism in Mn-based alloys.

16:00 *Sergey DEMISHEV*
H.O3 **LOCALIZED MAGNETIC MOMENTS, MAGNETIC TRANSITION AND TIME REVERSAL SYMMETRY BREAKING IN TOPOLOGICAL KONDO INSULATOR SmB_6**

An investigation of dynamic and static magnetic properties of high quality pristine single crystals of topological Kondo insulator (TKI) SmB_6 resulted in discovery of the magnetic transition at $T^* \sim 5.3$ K at the SmB_6 [110] surface. The localized magnetic moments in SmB_6 emerge below T^* and induce time reversal symmetry breaking responsible for protection of TKI state.

16:15 *Natalia KAZAK*
H.O4 **ELECTRONIC AND MAGNETIC STATES OF THE Co AND Fe IN LUDWIGITE SYSTEM $Co_{3-x}Fe_xBO_5$**

The XRD, magnetization, and Mössbauer spectroscopy studies on the single-crystalline $Co_{3-x}Fe_xBO_5$ ($0.0<x<1.0$) are presented along with XMCD data obtained on the end members. The role of M^{3+} ions in magnetic and electronic properties is discussed.

16:30 *Alexei BELIK*
H.O5 **UNUSUAL MAGNETIC PROPERTIES AND SPIN STRUCTURES IN QUADRUPLE AND SIMPLE EXOTIC PEROVSKITES**

We show our results on magnetic structure determination and physical properties of a large number of A-site-ordered quadruple perovskite manganites (R_2MnMnMn$_4$O$_{12}$, R_2MnMn(Mn$_{4-x}$M$_x$)O$_{12}$, AMn$_7$7O$_{12}$ (A = Cd, Ca, Sr, Pb, Y, La, Ce, Nd, Sm, Eu, and Bi) and simple perovskites (ScCrO$_3$, InCrO$_3$, Sc$_2$NiMnO$_6$, and In$_2$NiMnO$_6$) prepared by a high-pressure high-temperature method. They exhibit a number of different magnetic transitions and spin-induced multiferroic properties.

16:45 *Andrey KATANIN*
H.O6 **QUANTUM CRITICAL BEHAVIOR OF CORRELATED FERMIONIC SYSTEMS BEYOND HERTZ-MORIYA-MILLIS THEORY**

In view of theoretical and experimental interest in quantum phase transitions in strongly correlated fermionic systems, we consider two basic models of these systems: the doped Hubbard model on a simple cubic lattice with the nearest-neighbor hopping and the half-filled two-dimensional periodic Anderson model. For both models we obtain the quantum critical exponents which are distinctly different from those predicted by Hertz-Moriya-Millis theory and explain their origin.

17:00 *Alexey LUKOYANOV*
H.O7 **ELECTRONIC STRUCTURE AND MAGNETIC PHASE DIAGRAM OF Gd$_5$Sb$_3$**

In this work, the combined results of ab initio calculations accounting for strong electron correlations in Gd$_5$Sb$_3$ are reported together with the structural, magnetic, transport and calorimetric properties of this Mn$_5$Si$_3$–type hexagonal compound.

17:15 **Coffee break**

TUESDAY, 10.09.2019

Tuesday, 10.09.2019

Section A. Spintronics and magnetic nanostructures, Hall A

Chairperson: Mikhail MILYAEV

9:30 *Aleksandr CHUMAKOV*
A.I3 **TOWARDS NANO-SCALE MAGNETISM**

We consider applications of synchrotron radiation for studies of magnetism in ultra-high (∼Tpa) pressures using novel high-pressure instruments as double-stage diamond anvil cell, studies of magnetism with tiny samples as sub-micron iron-bearing inclusions in diamonds, the nano-scale landscape of magnetic avalanches in superconducting samples in experiments , and some other challenging applications enabled by coming development of synchrotron radiation sources.

10:00 *Andrey SVALOV*
A.O12 **THICKNESS DEPENDENCE OF MAGNETIC PROPERTIES OF Tb–Co/Ti AND Tb–Co/Si MULTILAYERS**

Tb–Co/Ti and Tb–Co/Si multilayers were prepared by radio frequency sputtering. The modification of the temperature dependence of magnetization with a decreasing Tb–Co layer thickness for Tb–Co-based multilayers indicates that there is a change in the “effective” Tb–Co layer composition. This can be explained by taking into account two factors: the reduction of the Co atom or/and a change of the fanning cone angle of Tb moments for a sperimagnetic structure in the Tb–Co layers.

10:15 *Artur USEINOV*
A.O13 **DIRECT TUNNELING AND RELATED TMR ANOMALIES IN MAGNETIC TUNNEL JUNCTIONS WITH EMBEDDED NANOPARTICLES**

Present work shows simulations of the direct tunneling through MgO layer in the magnetic tunnel junction with embedded nonmagnetic and magnetic nanoparticles (MNPs). The approach of weak MNPs is considered at low temperature, where the related values of the electron wavenumbers, as well as exchange energy in MNPs, are in a few times smaller than in the bulk. The studies show the way of valuable tunnel magnetoresistance (TMR) tuning.

10:30 *Ricardo LOPEZ ANTON*
A.O14 **STRUCTURAL AND MAGNETIC PROPERTIES OF Py/Ti MULTILAYERS**

The influence of the thickness of the Permalloy (Py) layers on the structural and magnetic properties of magnetron sputtered Py/Ti multilayers was studied. Magnetic and reflectivity measurements were comparatively analyzed to better understand the structure of the samples, and in special their interfaces. The presence of small superparamagnetic Py at the interfaces of the samples, especially evident in the samples with the thinnest Py layers, seems confirmed by the magnetic measurements.

10:45 *Takafumi MIYANAGA*
A.O15 **LOCAL MAGNETIC STUDY FOR CLUSTER-LAYERED Fe/Cr NANOSTRUCTURES**

The Kondo-like behavior, in which minimum is found in resistivity, has been observed in cluster-layered Fe/Cr nanostructures in 2006. In this ultrathin film, the small amount of Fe shows super-magnetic feature but no GMR. In this paper, we investigate X-ray magnetic circular dichroism (XMCD) and X-ray absorption fine structure (XAFS) to study the local magnetic structures and the mechanism of the characteristic magnetic feature of this cluster-layered Fe/Cr nanostructures.

11:00 **Coffee break**

Section F. Magnetoelastic, magnetocaloric and shape memory effects, Hall A

Chairperson: Igor NEKRASOV

11:30 *Joerg NEUGEBAUER*
F.I1 **AB INITIO DESCRIPTION OF COUPLING PHENOMENA BETWEEN MAGNETIC AND STRUCTURAL DEGREES OF FREEDOM**

Important questions are discussed: the impact of magnetic excitations and spin quantization on phonon spectra; coupling classical spin dynamics with ab initio molecular dynamics shows that at high temperatures features in excitation spectra arise that originate from coupling contribution; the impact of coupling on the thermodynamic and kinetic properties of point defects is discussed. It is shown that coupling contributions between physically different excitation mechanisms cannot be neglected.

12:00 *Akhmed ALIEV*
F.O1 **MAGNETOCALORIC EFFECT IN WEAK MAGNETIC FIELDS: Gd AND Ni–Mn–In ALLOY**

In this report, we present results of the direct measurement of MCE in weak cyclic magnetic fields with an amplitude of 50–3000 Oe and a frequency of up to 1 Hz. The Gd single crystal, as well as the Ni-Mn-In Heusler alloy, in which the ferromagnetic-paramagnetic phase transition, as well as the magnetostructural martensite-austenite phase transition take places, were investigated.

12:15
F.O2 *Adler GAMZATOV*
DYNAMIC MAGNETOCALORIC EFFECT IN THE $Ni_{50}Mn_{37-x}Al_xSn_{13}$ (x = 2, 4, 6, 8) RIBBON SAMPLES

12:30 *Elvina DILMIEVA*
F.O3 **MAGNETIC INDUCED MARTENSITIC TRANSITION IN HEUSLER ALLOYS IN HIGH MAGNETIC FIELDS**

The results of magnetoinduced martensitic transition study in high magnetic fields for Heusler alloys are presented. For this, the authors have developed a unique setup. It allows studying the evolution of a structural transition in high magnetic fields and adiabatic and isothermal conditions. The distinguishing results are the difference in the occurrence of a structural transition in different thermodynamic conditions and the influence of the residual phase on the magnetocaloric effect.

12:45 *Irina TERESHINA*
F.O4 **INVESTIGATION OF THE COMBINED EFFECT OF INTERSTITIAL AND SUBSTITUTIONAL ATOMS ON THE MAGNETIC PROPERTIES OF THE 4f–3d INTERMETALLICS**

We studied a combined influence of the substitutions and hydrogen absorption on the magnetocaloric properties of two classes of compounds: RCo_2 and RNi. The report presents the investigation of (Tb,Dy,Ho)Co_2–H system. MCE was determined by both direct and indirect methods. It is established that it decreases significantly upon hydrogenation. A completely different situation is observed for RNi-type compounds. We investigate of (Gd,Dy)(Ni,Si)–H system. Hydrogenation does not noticeably affect the value of MCE. The possibility of application in cryogenic devices is discussed.

13:00 **Lunch time**

Chairperson: Vladimir SOKOLOVSKIY

15:00 *Yurii KOSHKID'KO*
F.I2 **MAGNETOCALORIC EFFECT OF FERROMAGNETIC HEUSLER ALLOYS IN HIGH MAGNETIC FIELDS**

The report presents the results of studies of the magnetocaloric effect (MCE) in high magnetic fields for ferromagnetic Heusler Ni–Mn–Ga, Ni–Mn–In and Ni–Mn–Sn alloys. As a result of the research, the characteristic features of the MCE were found: 1) saturation of the value of ΔT_{ad} at high magnetic fields; 2) a giant reversible ΔT_{ad} in the field of the magnetostructural transition; 3) an increase in the value of the ΔT_{ad} with a decrease in the difference between T_C and M_S, etc.

15:30 *Igor NEKRASOV*
F.O5 **MAGNETOCALORIC EFFECT IN METALLIC STRONGLY CORRELATED SYSTEMS WITH VAN HOVE SINGULARITIES**

Within the framework of the Landau theory, the universality of the anomalous magnetocaloric effect is revealed for the first-order magnetic phase transition in metallic correlated systems. It is shown that the reason for this universality is the presence of phase separation accompanying any first-order phase transition. The possibility to controll the entropy chane sign via temperature and/or via carrier density is demonstrated. This might be usefull for practical applications.

15:45 *Kavita SRIKANTI*
F.O6 **MAGNETOCALORIC EFFECT AND HUGE ADIABATIC TEMPERATURE CHANGE IN $Mn_{1.15}Fe_{0.85}P_{0.65}Si_{0.13}Ge_{0.2}B_{0.02}$ ALLOY PREPARED BY SPARK PLASMA SINTERING**

In this work we present the magnetic and magnetocaloric properties of $Mn_{1.15}Fe_{0.85}P_{0.65}Si_{0.13}Ge_{0.2}B_{0.02}$ prepared by Spark Plasma Sintering and annealing. The post annealing of the sintered sample reduces the thermal hysteresis and also enhances the magnetic entropy to 19J/kg-K at 290 K in a field of 3 T. The huge magnetocaloric effect near room temperature observed in this system makes it a promising material for room temperature magnetic refrigeration.

16:00 *Abdulkarim AMIROV*
F.O7 **MULTICALORIC EFFECTS IN MAGNETOELECTRIC COMPOSITES**

The magnetoelectric (ME) composites as potential candidates for multicaloric materials were proposed and considered. The two type: 0–3 (mixed) and 2–2 (layered) composites on base of materials with giant magnetocaloric effect (MCE) were fabricated and their magnetic, caloric and magnetoelectric properties were studied. For both types of composites the possibility of tuning the MCE through the ME coupling between magnetic and ferroelectric components of composites were demostrated.

16:15 *Mutta VASUNDHARA*
F.O8 **Fe_3Al REVISITED; ENHANCED MAGNETOCALORIC EFFECT AND CRITICAL MAGNETIC BEHAVIOR**

Magnetic refrigeration is a cooling technique which is relies on the principle of magnetocaloric effect. With the advancement of this stimulating field of magnetic refrigeration and to start commercializing this technique, there is a need to search for new rare earth free, low cost soft ferromagnetic alloys which will be exciting for this purpose. We have investigated one such case i.e. Fe_3Al which is never explored in terms of magnetic cooling and we observed enhanced magnetocaloric effect.

16:30 *Nikolai MELNIKOV*
F.O9 **EFFECT OF LATTICE VIBRATIONS ON MAGNETIC PROPERTIES OF METALS AT FINITE TEMPERATURES**

The electron-phonon interaction is taken into account in the dynamic spin fluctuation theory. An expression is obtained for the self-energy part explicitly depending on spin fluctuations and lattice vibrations. The results are illustrated in the example of Fe and Ni. The effect of phonons on the temperature dependence of magnetic characteristics of metals is considerable but not as large as in the static single-site spin fluctuation theory and spin dynamics with classical Hamiltonians.

16:45 *Sergey SHEVYRTALOV*
F.O10 **INTERNAL STRESSES INFLUENCE ON FUNCTIONAL PROPERTIES OF Ni–Mn–Ga HEUSLER-TYPE MICROWIRES**

The influence of internal stresses on structural, magnetic properties and phase transitions of Ni–Mn–Ga glass-coated microwires with a high Ni content was investigated. We produced two types of microwire: No.1 — $Ni_{63}Mn_{12}Ga_{25}$ with full diameter D = 54.6 μm and metallic nucleus diameter d = 26.7 μm; No.2 — $Ni_{61}Mn_{12}Ga_{27}$ with D = 21.4 μm and d = 13.6 μm. An analysis of a separate influence of stresses and high-temperature annealing on structural and magnetic properties of the microwires was done.

17:15 **Coffee break**

Section M. Magnetism in biology and medicine, Hall B

Chairperson: Sergey KOMOGORTSEV

9:30 *Felix BLYAKHMAN*
M.I1 **MAGNETIC NANOPARTICLES AS A STRONG CONTRIBUTOR TO THE FERROGEL BIOCOMPATIBILITY**

The biomedical engineering is the most promising area of ferrogels use as scaffolds for needs of the regenerative medicine, drug delivery, biosensing etc. This study addresses a role of magnetic nanoparticles (MNPs) in determining the adhesive and proliferative potential of cells. We present the results of experiments on the polyacrylamide gels filled with MNPs, and show the direct role of MNPs in the determining of cells biological activity independent on the physical properties of ferrogels.

10:00 *Karsten KUEPPER*
M.I2 **OPTICAL, ELECTRONIC AND MAGNETIC PROPERTIES OF HIGHLY Mn-DOPED β-$NaGdF_4$ AND β-$NaEu_4$ NANOPARTICLES WITH NARROW SIZE DISTRIBUTION**

We have performed a detailed study of the magnetic and optical properties of manganese doped β-$NaGdF_4$ and β-$NaEuF_4$ nanoparticles with narrow size distribution. XPS as well as XRF experiments confirm the successful doping of ∼11% Mn into β-$NaGdF_4$ and β-$NaEuF_4$ nanoparticles. We study the chemical, magnetic and optical properties of these nanoparticles by means of a combinatorial approach of complementary x-ray spectroscopic, magnetic and optical ultraviolet approaches.

10:30 *Sergey LYASCHENKO*
M.O1 **SYNTHESIS AND PROPERTIES OF Fe–Si MAGNETIC NANOPARTICLES FOR BIOMEDICAL APPLICATIONS**

The main problems of the creation and application of biocompatible magnetic nanoparticles for the diagnosis and targeted magnetomechanical therapy of oncological diseases are considered. A new method for the synthesis of biocompatible magnetic nanoparticles based on Fe–Si has been proposed, the properties of the synthesized nanoparticles have been investigated.

10:45 *Artem MININ*
M.O2 **IRON-CORE CARBON-SHELL NANOPARTICLES FOR BIOLOGY AND MEDICINE**

Metal-carbon (Me@C) nanoparticles with a metal core-carbon shell structure are synthesized by gas-phase synthesis from a metal melted by a high-frequency magnetic field and blown with an inert carrier gas with hydrocarbon admixture. If iron and other ferromagnetic metals are taken as the metal precursor, the resulting nanoparticles have a high saturation magnetization (of the order of 100 emu/g or more), they are chemically stable, the carbon shell is relatively easily modified.

11:15 **Coffee break**

Chairperson: Felix BLYAKHMAN

11:30 *Grigory MELNIKOV*
M.O3 **DESIGNING MAGNETIC MATRICES FOR CELL TECHNOLOGY SUPPORTING DEVICES**

The control and manipulation of living cells by an external stimulus is important direction of the tissue engineering applications. In this work, we have proposed, designed and tested a magnetic system consisting of an equidistant set of the identical permanent magnets (6×4 assay) in order to get insight on the potential of its experimental usage in biological studies with cells culturing in a magnetic field.

11:45 *Danil BUKHVALOV*
M.O4 **ELECTRON CORRELATIONS IN COORDINATION METAL COMPLEXES PROSPECTIVE FOR BIOMEDICAL MATERIALS**

We discuss essential magnetic and electronic properties (SQUID, EPR, resistivity, DFT calculations) of certain groups of coordination metal complexes which seem to be prospective for biomedical applications as components in hybrid and composite materials or prosthetic groups.

12:00 *Aleksandr KAMZIN*
M.O5 **CORE/SHELL MAGNETIC NANOPARTICLES FOR BIOMEDICAL APPLICATIONS: SYNTHESIS AND MÖSSBAUER STUDIES**

Progress in techniques for fabrication of magnetic nanoparticles (MNPs) has enabled the development of methods for synthesis of new types of MNPs (e.g., core/shell (C/S) type). The main advantage of such MNP is their polyfunctionality, as well as the possibility of optimizing the target physicochemical properties of the core material. The creation of C/S type MNP is due to the need for core isolation, for example, by biologicaly compatible shell and/or develop new properties.

13:00 **Lunch time**

Round table. Modern equipments and methods, Hall B

Chairpersons: Andrey ROGALEV, Aleksandr NOSOV

15:00 *Alexey ERMAKOV*
RT.1 **EUROPEAN XFEL: THE STUDY OF MATTER DEEP INSIDE. METALLURGICAL LAB AS AN INSTRUMENT FOR QUALITY CONTROL AND SRF MATERIAL INVESTIGATION**

The European XFEL based on superconducting linear accelerator was built to provide ultrashort brilliant X-Ray flashes as well intense X-Ray flashes to study in very detail not only the solids but the structure of viruses, monitor chemical reactions, etc. Within the scope of EXFEL Project the metallurgical Lab was established. The Lab having the large variety of different instruments was successfully implemented in testing of superconducting material Nb and qualification of cavities' SFPs.

15:30 *Nikolai KISELEV*
RT.2 **OFF-AXIS ELECTRON HOLOGRAPHY FOR QUANTITATIVE MEASUREMENTS OF MAGNETIC TEXTURES**

Particle-like magnetic textures, such as chiral skyrmions, bobbers, and hopfions epresent one of the most rapidly developing field in modern nanomagnetism. These objects draw significant interest in fundamental research and applications due to their unusual static and dynamic properties, nanoscale size, and transport properties under electric current. From the experimental point of view, essential is the ability to detect such objects and reconstruct corresponding three-dimensional (3D) magnetic textures. Transmission electron microscopy (TEM) represents one of the best techniques for magnetic imaging available at the moment. There are many advanced approaches allowing high-resolution imaging with TEM. In this presentation, I will discuss both Fresnel imaging and off-axis electron holography in an aberration-corrected TEM. The basic principles of off-axis electron holography and examples of its use in practice for imaging of magnetic skyrmions and chiral bobbers in nanostructured samples are presented. The phase images of the induction magnetic field are analyzed using a model-based iterative reconstruction algorithm, which allows determining the distribution of the projected in-plane component of magnetization in the sample. Prospects for characterizing more complex magnetic textures with this technique are discussed.

16:00 *Yury BUGOSLAVSKY*
RT.3 **MAGNETIC FIELDS, LOW TEMPERATURES AND PHYSICAL MEASUREMENTS: AN OVERVIEW OF METHODS USED IN CRYOGENIC EQUIPMENT**

If you are thinking of setting up a low-temperature experiment, where would you start? In this presentation I outline design principles of magnetic measurement equipment and illustrate them with examples of systems manufactured by Cryogenic Ltd.

16:30 *Andrey OMIROV*
RT.4 **SCIENTIFIC EQUIPMENT FOR RESEARCH LABORATORIES**

16:45 *Yury VYSOKIKH*
RT.5 **MODERN AFM TECHNIQUES FOR MAGNETIC DOMAIN STRUCTURE INVESTIGATION**

17:15 **Coffee break**

Section B. Spin dynamics and magnetic resonances, Hall C

Chairperson: Aleksandra KALASHNIKOVA

9:30 *Dirk GRUNDLER*
B.I1 **ARTIFICIAL CRYSTALS AND QUASICRYSTALS FOR NANOMAGNONICS BASED ON FERRO- AND FERRIMAGNETIC NANOSTRUCTURES**

We will review our experimental and computational studies on magnons in both periodic nanomagnet lattices and artificial ferromagnetic quasicrystals nanopatterned from thin films of permalloy, CoFeB and/or thin yttrium iron garnet.

10:00 *David SZALLER*
B.I2 **SWITCHABLE ONE-WAY TRANSPARENCY VIA COUPLED MAGNETIC AND ELECTRIC RESONANCES**

One-way transparency of simultaneously magnetic and polar (multiferroic) crystals became an intensively studied topic. However, the design of one-way transparent devices with specified optical spectrum is still an open task. A minimal model of one-way transparency consists of a pair of coupled magnetic and electric resonances, which can be realized in multiferroics and in metamaterial structures, opening the path to custom-designed, electrically or magnetically switchable optical response.

10:30 *Lenar TAGIROV*
B.O1 **INTERLAYER COUPLING IN ULTRATHIN EPITAXIAL CoO/Co/Ag/Fe/MgO HETEROSTRUCTURES**

Ultrathin CoO/Co/Ag/Fe(x) heterostructures were grown epitaxially on single-crystal MgO substrate under ultra-high vacuum conditions. Magnetic properties of the samples were studied utilizing magnetometry and FerroMagnetic Resonance techniques. Magnetic hysteresis loops recorded for samples with different thickness x of the iron layer and angular dependence of the FMR spectra, measured along the hysteresis loop, indicate interlayer exchange coupling of Co and Fe layers via 4 nm of silver.

10:45 *Vasiliy GLAZKOV*
B.O2 **MAGNETIC RESONANCE IN A QUASY-2D ANTIFERROMAGNET $Ba_2MnGe_2O_7$**

We report results of ESR study of quasy-2D easy-plane antiferromagnet $Ba_2MnGe_2O_7$. This compound orders at T_N=4.2 K. Transition temperature is marked by characteristic transformation of the ESR absorption spectra confirming easy-plane ordering. We have determined zero-field magnon gap (25 GHz at 1.5 K) and its temperature dependence. We have found smaller gap (3 GHz at 1.5 K) which is due to Mn hyperfine coupling. Evolution of ESR linewidth above T_N follows BKT scenario.

11:00 **Coffee break**

Chairperson: Lenar TAGIROV

11:30 *Konstantin MIKHALEV*
B.O3 **NMR STUDY OF MAGNETIC NANOPARTICLES Ni@C**

The ^{61}Ni, ^{13}C NMR spectra in the nanoparticles Ni@C have been obtained and the magnetization has been measured. It has been shown that the cores of nanoparticle consists of metallic nickel phase, Ni:C solid solution and nickel carbide Ni_3C. Carbon shell of investigated nanoparticles consists of amorphous glass-like carbon.

11:45 *Leonid LUTSEV*
B.O4 **SPIN WAVES IN NANOSIZED YIG FILMS: TOWARDS LOW RELAXATION AND DESIRABLE MAGNETIC PROFILE**

In order to answer the question — how can we reduce the relaxation in spin-wave devices produced on nanosized YIG films with desirable profile, we study ferromagnetic resonance spectra and propagation of spin waves in YIG films grown on $Gd_3Ga_5O_{12}$ and $Nd_3Ga_5O_{12}$ substrates at different growth temperature.

12:00 *Natalia POLZIKOVA*
B.O5 **YIG THICKNESS INFLUENCE ON RESONANT MAGNETOELASTIC SPIN PUMPING**

We report on the influence of the yttrium iron garnet (YIG) thickness on the phonon — magnon interconversion efficiency and hence, on the acoustic spin pumping efficiency. The excitation and detection of spin wave resonances in submicron and nanometer YIG films are in a bulk acoustic wave resonator. Due to the inhomogeneous character of the exciting effective magnetic field of an elastic origin, higher SWR modes can be generated with an efficiency comparable to that of the main mode.

12:15 *Denis TSIKALOV*
B.O6 **SPIN-WAVE RESONANCE IN GRADIENT FERROMAGNETS WITH A PARABOLIC BARRIER OF MAGNETIC PARAMETERS**

A theory of spin-wave resonance in ferromagnet with a parabolic barrier of the effective magnetic field is developed. The law of the dependence of resonance frequency on mode number n in the form $\omega_n \sim (n - 1/2)^{1/2}$ is obtained, which differs sharply from the well-known laws $\omega_n \sim n$ for potential well and $\omega_n \sim n^2$ for homogeneous film. Changing the shape of the function $\omega_n(n)$ as well as a sharp decrease in ξ_n in the point $n = n_c$, makes it possible to experimentally determine the height of potential barrier.

12:30 *Michael BORICH*
B.O7 **DEGENERATED NUCLEAR MAGNETOSTATIC MODES IN FERROMAGNETS**

A theoretical investigation of the properties of nuclear spin waves in ferromagnetic samples of finite size of spheroidal shape has been performed. The behaviour of nuclear spin waves depends on the magnetic field and the sample shape in the systems of this type, and some modes degenerate, i. e. different modes can have the same frequency.

12:45 *Alexey SEMENO*
B.O8 **ANTIFERROMAGNETIC RESONANCE IN GdB_6**

First observation of electron spin resonance (ESR) in the antiferromagnetic phase of the metallic antiferromagnet GdB_6 (T_N = 15.5 K) is reported. The results demonstrate the important role of the dynamic of Gd^{3+} ions in rigid boron lattice on ESR behavior.

13:00 **Lunch time**

Chairperson: Konstantin MIKHALEV

15:00 *Yury BUNKOV*
B.I3 **SPIN SUPERFLUIDITY AT ROOM TEMPERATURE**

The conventional magnon Bose-Einstein condensation (BEC of magnons with $k = 0$) has been observed in magnetically ordered materials with repulsive interaction between magnons. In particularly it was observed in Yttrium Iron Garnet (YIG) film, magnetized perpendicular to the surface.

15:30 *Natalia OSTROVSKAYA*
B.O9 **QUALITATIVE THEORY OF DYNAMICAL SYSTEMS FOR CONTROL OF MAGNETIC MEMORY ELEMENTS**

The unified approach to the description of magnetization dynamics in the free layer of a magnetic memory element is developed. For this purpose, the analysis of the singularities of the dynamical system is used as a basis. This approach allowed us to classify the dynamical modes of magnetization dynamics, and to determine the threshold values of the field and current for changing the type of dynamics.

15:45 *Alexandr SADOVNIKOV*
B.O10 **LATERAL AND VERTICAL SPIN-WAVE TRANSPORT IN MAGNONIC NETWORKS**

In the present work we demonstrate the experimental observations of the strain-mediated spin-wave coupling phenomena in different magnonic structures based on the asymmetric adjacent magnonic crystals, adjacent magnetic yttrium iron garnet stripes and array of magnetic stripes, which demonstrates the collective spin-wave phenomena. The voltage-controlled spin-wave transport along bilateral magnonic stripes was demonstrated.

16:00 *Nikolai KHOKHLOV*
B.O11 **OPTICALLY-EXCITED MAGNETOSTATIC WAVES IN A THIN EPITAXIAL GALFENOL FILM DRIVEN BY ULTRAFAST ANISOTROPY CHANGES**

We employ ultrafast laser-induced thermal changes of magnetocrystalline anisotropy to excite propagating spin waves for the first time ever. We demonstrate that tightly focused 70-fs laser pulses incident on a metallic ferromagnetic film of Galfenol excite the packets of magnetostatic surface waves detectable at distances up to 10 microns from the excitation spot. By changing orientations of external magnetic field we can control the amplitude, group and phase velocities of the spin waves.

16:15 *Alexey DROVOSEKOV*
B.O12 **FERROMAGNETIC RESONANCE STUDIES OF Fe/Pd/Gd/Pd FERRIMAGNETIC SUPERLATTICES**

We study the influence of Pd spacers on ferromagnetic resonance properties of Fe/Pd/Gd/Pd multilayers. The investigated structures show a complex evolution of FMR spectra in the temperature range 4.2–293 K. Theoretical analysis of the experimental data shows relatively slow decrease of AFM coupling between Fe and Gd layers with increase of Pd spacer thickness. At the same time we observe a strong suppression of Curie temperature in Gd layers comparing with the case of pure Fe/Gd structure.

16:30 *Olga BABANOVA*
B.O13 **NMR STUDY OF ATOMIC MOTION IN $NaB_{11}H_{14}$ AND Na-7-$CB_{10}H_{13}$**

In the present work, we report the results of nuclear magnetic resonance (NMR) studies of the tetradecahydro-nido-undecaborate anion $[B_{11}H_{14}]^-$ and di-μ-hydro-undecahydro-7-monocarba-nido-undecaborate anion $[7\text{-}CB_{10}H_{13}]^-$, and Na^+ cation dynamics in $NaB_{11}H_{14}$ and Na-7-$CB_{10}H_{13}$.

16:45 *Yury FILIMONOV*
B.O14 **SPIN WAVES IN YIG-BASED NETWORKS: LOGIC AND SIGNAL PROCESSING**

Spin waves propagation in magnonic network based on orthogonal YIG thin film waveguides were studied both numerically and experimentally. Spin waves constructive and destructive interference discussed for spin wave logic and microwave signal processing applications.

17:15 **Coffee break**

Section H. Magnetism of strongly correlated electron systems, Hall D

Chairperson: Alexander MOSKVIN

9:30 *Sergey NIKITOV*
H.I6 **QUANTUM FLUCTUATIONS IN MAGNETIC NANOSTRUCTURES**

10:00 *Valentin IRKHIN*
H.I7 **GIANT DENSITY OF STATES VAN HOVE SINGULARITIES AND MAGNETISM IN CUBIC LATTICES**

Giant density of states van Hove singularities and magnetism in cubic lattices are analyzed.

10:30 *Elena KOKORINA*
H.O8 **$GdFe_2$ LAVES PHASE UNDER PRESSURE: AB INITIO CALCULATIONS**

Here we present first-principle results on magnetic and electronic properties of $GdFe_2$ compound — a typical representative of a C15 Laves phase compounds under different hydrostatic pressures.

12:30 *Alexandra VYAZOVSKAYA*
H.O9 **THE ORIGIN AND SPIN SPLITTING OF TWO-DIMENSIONAL ELECTRONIC STATES AT SURFACES OF THE $GdRh_2Si_2$(001)**

We present a first-principles study of the $GdRh_2Si_2$(001) surface electronic structure. Two surfaces, Si- and Gd-terminated, are considered. The origin of the two-dimensional electronic states and the influence of spin-orbit and magnetic interactions on these states at both terminations are investigated. In this way we explain their dispersion seen in angle-resolved photoemission spectroscopy experiments.

11:00 **Coffee break**

Chairperson: Oleg SUSHKOV

11:30 *Philippe BOURGES*
H.I8 **MAGNETISM IN SPIN-ORBIT COUPLED IRIDATES**

We have been investigated the magnetic properties of strontium iridate Sr_2IrO_4 (as well with Rh substitution) using polarized neutron diffraction. First, we found magnetic moments produced by orbital loop currents in the hidden odd-parity order phase. Second, we report an anisotropic and aspherical magnetization density distribution, showing that the xy orbital contribution is predominant suggesting a deviation with the local J_{eff} = 1/2 picture.

12:00 *Vasiliy BUCHELNIKOV*
H.I9 **CORRELATION EFFECT ON THE GROUND STATE PROPERTIES OF HEUSLER ALLOYS**

In this paper we discuss the correlation effects on the ground state of Ni–(Co)–Mn–Sn and other Heusler compounds using GGA PBE and meta-GGA SCAN functionals.

10:45 *Natalia ORLOVA*
H.O10 **A NEW QUANTUM MODEL OF THE SPIN SUBLATTICES: PROBLEMS AND PROSPECTS**

The new quantum model of the spin sublattices is proposed. It connects the conditions of their existence with three parameters of the substance: the exchange field, the magnetic anisotropy field and the number of spins in the sublattice. The effects are discussed that were not described by the solutions of the Landau-Lifshitz equations. They are associated with the destruction of the spin sublattices.

12:45 *Andrey MIKHEYENKOV*
H.O11 **ULTRACOLD ATOMS WITH ADDITIONAL DEGREE OF FREEDOM. SPIN-ORBITAL VIEW**

We address the system with two species of vector bosons in an optical lattice. In addition to the standard parameters characterizing such a system, we are dealing with the “degree of atomic nonidentity”, manifesting itself in the difference of tunneling amplitudes and on-site Coulomb interactions. We obtain a cascade of quantum phase transitions occurring with the increase in the degree of atomic nonidentity.

13:00 **Lunch time**

Chairperson: Kliment KUGEL

15:00 *Daniel KHOMSKII*
H.I10 **“MOLECULES” IN SOLIDS AGAINST MAGNETISM**

15:30 *Ernst BAUER*
H.I11 **WEAK FERROMAGNETISM OF STOICHIOMETRIC AND OFF-STOICHIOMETRIC Fe_2VAl BASED FULL HEUSLER SYSTEMS**

The aim of the present study is an experimental and theoretical evaluation of the magnetic state of full Heusler based Fe2VAl alloys by magnetic (susceptibility and magnetisation) as well as on electronic transport measurements (electrical resistivity, Hall and Seebeck effect) in a wide temperature range, in conjunction with VASP based DFT calculations. The evolution of physical properties due to these modifications, in general, yields a dramatic enhancement of thermoelectric properties.

16:00 *Tanusri SAHA-DASGUPTA*
H.I12 **INTERPLAY OF ALTERNATION AND FURTHER NEIGHBOR INTERACTION IN S=1/2 SPIN CHAINS: A CASE STUDY OF $Cs_2CuAl_4O_8$**

Using Wannier function formulation and total energy calculations by first-principles density functional theory (DFT), we derive the underlying spin model of a recently synthesized compound, $Cs_2CuAl_4O_8$, having zeolitelike network structure. The computed magnetic interactions show that the interchain Cu–Cu interactions are negligibly small compared to intrachain Cu–Cu interactions, thus characterizing $Cs_2CuAl_4O_8$ as a prototypical one-dimensional (1D) spin-1/2 system. Interestingly, the DFT-derived 1D spin model features a combination of alternating ferromagnetic-antiferromagnetic interactions, together with the presence of both nearest- and next-nearest-neighbor interactions, making it an unprecedented case. The presence of spin gap is suggested by quantum Monte Carlo simulations in the zero-field condition, which is cross-checked by a more rigorous exact diagonalization study. Motivated by the intricacy of the derived spin model, we further examine the ground-state properties of this model in the parameter space of exchange interactions, which shows the possibility of driving quantum phase transition between gapped and gapless spin excitation. Our study is expected to shed light on the fascinating world of 1D quantum spin systems.

16:30 *Sergey BRENER*
H.O12 **EFFECTIVE HEISENBERG MODEL AND EXCHANGE INTERACTION FOR STRONGLY CORRELATED SYSTEMS**

Exchange interaction in extended Hubbard model is derived in a controlled way using one-particle properties in the limit ofwell-developed local moment.

16:45 *Vladimir ZVEREV*
H.O13 **THE MAGNETIC MOMENTS OF Rh IN FeRh ALLOYS**

Among materials with AFM - FM transitions near room temperature, FeRh represents an interesting model for basic research relevant to solid state refrigeration. While it is well-known that properties of FeRh alloys vary substantially with heat treatment, complete understanding of the related phenomena is lacking. Here we provide an experimental prove of the fact that the hypothesis Rh magnetic moments arise from the exchange field at Rh atoms induced from neighbouring Fe moments.

17:00 *Alexander ULYANOV*
H.O14 **SELF-DOPED $Pr_{1-x}MnO_{3+\delta}$ MANGANITES. XANES AND EXAFS STUDY**

Local crystal and electronic structure of $Pr_{1-x}MnO_{3+\delta}$ (x = 0.0, 0.2) perovskites was studied with x-ray absorption spectroscopy. Mn L-edge spectra showed the splitting into L_3 and L_2 peaks, intensity of peaks increases with x manifesting that change of magnetic properties is caused by change of level of hybridization of Mn 3d and the O 2p states. Fourier transform of EXAFS spectra showed a change of local crystal structure.

17:15 **Coffee break**

Section L. Magnetic soft matter, Hall E

Chairperson: Yuriy RAIKHER

11:30 *Sofia KANTOROVICH*
L.I7 **MAGNETIC MICROGELS**

The presence of magnetic particles dramatically changes the behaviour of microgels and also offers an additional mechanism to control their properties.

12:00 *Peter KOPCANSKY*
L.I8 **MAGNETICALLY ANISOTROPIC SYSTEMS BASED ON LIQUID CRYSTALS AND MAGNETIC FLUIDS**

About 5 decades ago the idea was born to mix nano-sized magnetic particles with nematic LCs, in order to get fluids with a large magnetic susceptibility (frequently called ferronematics) (FNs). These materials may give a strong push for the development of many kinds of new magnetically controlled LC-devices, serving as sensitive anisotropic magnetic materials (e.g. sensors of small magnetic fields).

12:30 *Stefan ODENBACH*
L.I9 **MICROSTRUCTURE ANALYSIS IN MAGNETORHEOLOGICAL ELASTOMERS —A PATH TOWARDS A SCALE-BRIDGING UNDERSTANDING OF MAGNETIC HYBRID MATERIALS**

The knowledge of changes in the micro-structure of magnetorheological materials, i.e. a knowledge concerning the spatial arrangement of the magnetic particles and its changes due to external stimuli is an important prerequisite for a detailed understanding of the magnetic field driven effects found in these materials. X-ray microtomography will be introduced as a tool to obtain three dimenaional representations of the material allowing analysis of changes on single particle level.

13:00 **Lunch time**

Chairperson: Stefan ODENBACH

15:00 *Yuriy RAIKHER*
L.I10 **MAGNETIZATION OF ELASTICALLY TRAPPED PARTICLES CONSISTING OF STONER-WOHLFARTH GRAINS**

Magnetization curves of soft elastomeric matrices filled with NdFeB microparticles are modelled. This magnetic filler is specific: each its particle is a dense clot of Stoner-Wohlfarth (SW) nanograins with easy axes distributed at random. The magnetization problem resembles the SW one for a random assembly but in this case the assembly is able not only to switch grain-by-grain but also to mechanically rotate as a whole in the matrix thus changing the grain switching thresholds “on the flight”.

15:30 *Jeyadevan BALACHANDRAN*
L.I10 **SHAPE AND SIZE-DEPENDENT MAGNETIC BEHAVIOR OF MAGNETITE NANOPARTICLES IN INTERACTION-FREE SYSTEM**

Magnetic properties of NPs are predicted from the classical magnetic theories based on the properties of the bulk counterpart with little success. Here, we report the synthesis of magnetite NPs of definite shape and sizes, coating the same with non-magnetic silica layer of different thicknesses, preparation of magnetic interaction-free nanoparticle system and results of the measurement of true magnetic properties of magnetite with different shapes and sizes.

16:00 *Andrey KUZNETSOV*
L.O6 **ZERO-FIELD AND FIELD-INDUCED INTERACTIONS BETWEEN MULTICORE MAGNETIC NANOPARTICLES**

Magnetic interactions in a suspension of multicore magnetic nanoparticles are studied numerically. In zero-field, nanoparticles experience a weak attraction, which is a direct superparamagnetic analog of the van der Waals interaction between a pair of dielectric spheres. It can lead to the formation of isotropic aggregates resembling that observed in a Lennard-Jones fluid. In a uniform field, nanoparticles form chains with lateral zipper-like defects.

16:15 *Segun GOH*
L.O7 **A DENSITY FUNCTIONAL APPROACH TO FERROGELS: MAGNETOSTRICTIONS AND ELASTIC CONSTANTS**

We report a density functional approach for ferrogels, in which magnetic particles are embedded in elastic media. Computing the free-energies of model systems with magnetic dipoles and springs, we investigate the mechanical properties of the ferrogels, in response to changes in the dipole moments.

17:15 **Coffee break**

WEDNESDAY, 11.09.2019

Wednesday, 11.09.2019

PLENARY LECTURES, Hall A
Chairperson: Sergey NIKITOV

9:30 *Andrey ROGALEV*
Pl.5 **X-RAY MAGNETIC CIRCULAR DICHROISM: RECENT ADVANCES**

Overview of X-ray magnetic circular dichroism technique is given. Special emphasis is laid on the recent advances in the field: studies under high pressure, ultralow temperatures and under high magnetic field.

10:10 *Theo RASING*
Pl.6 **ALL OPTICAL MAGNETIC SWITCHING AND BRAININSPIRED CONCEPTS FOR LOW ENERGY INFORMATION PROCESSING**

10:50 **Coffee break**

Section C. Low dimensional magnetism, Hall A
Chairperson: Markus BRADEN

11:20 *Reinhard KREMER*
C.I1 **FRUSTRATED J1–J2 QUANTUM SPIN CHAINS**

I shall provide an overview of our recent experimental investigations into various J1–J2 frustrated quantum spin chains with a special emphasis on the search for the spin-nematic phase close to magnetic saturation in the system $LiCuVO_4$.

11:50 *Olga VOLKOVA*
C.I2 **MAGNETOELECTRIC EFFECTS IN LOW DIMENSIONAL SYSTEMS**

In order to unveil the role of alkali metal subsystem in the temperature evolution and mutual influence of charge and spin subsystems in $ACuFe_2(VO_4)_3$ (A = Li, Na) howardevansites, we performed a systematic study of magnetic and dielectric properties of $ACuFe_2(VO_4)_3$ (A = Li, Na) compounds. Besides, there were provided first principles calculations of exchange interaction parameters in $ACuFe_2(VO_4)_3$ (A = Li, Na) compounds.

12:20 *Evgeniia KOMLEVA*
C.O1 **COMPETITION BETWEEN THE SPIN-ORBIT COUPLING AND MOLECULAR ORBITALS IN $Ba_4NbX_3O_{12}$ (X = Mn, Rh, Ir)**

Ab initio electronic structure calculations for novel $Ba_4NbX_3O_{12}$ compounds with structural transition metal (TM) trimers show the picture of localized electrons to be more suitable for 3*d* TM clusters (on the example of Mn-based system) while 5*d* TM (Ir) trimers can be described with molecular-orbital (MO) picture. We speculate that for 4*d* compounds (Rh and Ru) MO picture is a good starting point but correlation effects should necessarily be taken into account.

12:35 *Alexander KURBAKOV*
C.O2 **NEUTRON SCATTERING STUDIES OF THE LOW-DIMENSIONAL MAGNETISM IN THE HONEYCOMB LAYERED $Na_2Ni_2TeO_6$ COMPOUND**

Neutron scattering was used to study mechanisms of magnetic order formation in the quasi-two-dimensional honeycomb $Na_2Ni_2TeO_6$. Overextended magnetic phase transition occurs in the system, which, at the first stage, manifests itself in the gradual formation of a structure with short-range magnetic order. The translational and magnetic symmetry of the state with strong magnetic correlations above the T_N corresponds to the zigzag-type long-range magnetic order in the ground state.

12:50 **Lunch time**

15:00 **Excursion**

19:00 **Conference dinner**

Section G. Frustrated and disordered magnetism, Hall B

Chairperson: Alexander SMIRNOV

11:20 *Felix KASSAN-OGLY*
G.I1 **PHASE TRANSITIONS AND CRITICAL PHENOMENA IN FRUSTRATED SYSTEMS**

In the present work, using the Monte Carlo method we research the influence of the exchange interaction competition on PTs and magnetic properties of antiferromagnetic Ising and Heisenberg model on a body-centered cubic lattice with next-nearest neighbor interactions, of the layered triangular antiferromagnetic Ising model with the intralayer next-nearest neighbor interaction and Potts model on a triangular lattice.

11:50 *Leonid SVISTOV*
G.I2 **SEARCH FOR NEMATIC PHASES IN FRUSTRATED MAGNETS**

12:20 *Joachim WOSNITZA*
G.I3 **FRUSTRATED AND LOW-DIMENSIONAL MAGNETIC MATERIALS IN HIGH MAGNETIC FIELDS**

Frustrated and low-dimensional spin systems show a wealth of different magnetic states depending on the specifics of their internal interactions and on external parameters such as magnetic field, pressure, and doping. Here, I will present some selected studies of frustrated magnetic materials in ultra-high pulsed magnetic fields that have been shown to host a broad range of fascinating new and exotic phases.

12:50 **Lunch time**

15:00 **Excursion**

19:00 **Conference dinner**

Section I. Magnetism and superconductivity, Hall C

Chairperson: Alexander MELNIKOV

11:20 *Maxim KORSHUNOV*
I.I1 **MAGNETIC INTERACTIONS, SUPERCONDUCTIVITY, AND SPIN-RESONANCE PEAK IN IRON-BASED MATERIALS**

Superconducting state in iron-based pnictides and chalcogenides is discussed in the context of the pairing due to the spin fluctuations. Order parameter has an unconventional symmetry and the system demonstrates unusual spin response with the spin resonance feature. We demonstrate, how several experimental observations reconciled with the scenario under discussion.

11:50 *Anatoly SLOBODCHIKOV*
I.O1 **INFLUENCE OF ORTHORHOMBIC DEFORMATIONS IN CuO_2 PLANE ON THE ELECTRONIC STRUCTURE OF HIGH-T_c CUPRATE FAMILY**

It is widespread believed that all hole-doped high-temperature superconducting cuprates have a common generic phase diagram in the plane. In fact, the phase diagram of cuprates is determined not only by doping degree x but also by the strain of CuO_2 lattice. In this work we theoretically investigate effect of CuO_2 lattice parameter variation on the electronic structure of HTSC cuprate La_2CuO_4 in the orthogonal phase at different concentration of doped holes.

12:05 *Yury PANOV*
I.O2 **CRITICAL TEMPERATURES OF A MODEL CUPRATE**

The relationship between superconductivity and other competing orderings is a hotly debated topic in the physics of high-T_C cuprate materials. We present the mean-field approximation results for the spin-pseudospin model accounting for the on-site and inter-site correlations, the antiferromagnetic exchange coupling, the one- and two-particle transport. The explicit form of the equations for the critical temperatures of the most significant order parameters are given.

12:20 *Andrey KAMASHEV*
I.03 **SUPERCONDUCTING SPIN-VALVE EFFECT IN A HETEROSTRUCTURES CONTAINING THE HEUSLER ALLOY AS FERROMAGNETIC LAYERS**

We have studied the superconducting properties of the spin-valve structures containing Heusler alloy $Co_2Cr_{1-x}Fe_xAl$ as one of two ferromagnetic layers of F1/F2/S structure. We used the Heusler alloy layer in the F1/F2/S structure in two roles: as a weak ferromagnet on the place of an F2 layer and as a half-metal on the place of an F1 layer. In the first case, we obtained the large ordinary superconducting spin-valve effect ΔT_C; in the second case — the giant magnitude of ΔT_{ctrip} reaching 0.5 K.

12:50 **Lunch time**

15:00 **Excursion**

19:00 **Conference dinner**

THURSDAY, 12.09.2019

Thursday, 12.09.2019

PLENARY LECTURES, Hall A
Chairperson: Sang-Wook CHEONG

9:30 *Ramamoorthy RAMESH*
Pl.7 **ELECTRIC FIELD CONTROL OF MAGNETISM FOR ULTRALOW POWER ELECTRONICS**

10:10 **Break**

Section C. Low dimensional magnetism, Hall A
Chairperson: Arseny SYROMYATNIKOV

10:15 *Markus BRADEN*
C.I3 **MAGNETISM IN THE LAYERED RUTHENATES $Ca_{2-x}Sr_xRuO_4$**

We discuss the magnetic correlations in layered ruthenates from the unconventional superconductor Sr_2RuO_4 to the Mott insulator Ca_2RuO_4 in the aim to illustrate the possible role of magnetic excitations in the superconducting pairing of Sr_2RuO_4.

10:45 *Vladislav KATAEV*
C.I4 **UNUSUAL MAGNETIC CONTINUUM IN THE PROXIMATE SPIN LIQUID COMPOUND α-$RuCl_3$**

The celebrated Kitaev's honeycomb-lattice compass model possesses a quantum spin liquid ground state and exotic fractionalized excitations. α-$RuCl_3$ is proposed to be a proximate realization of this model. In our ESR experiments we have discovered a highly unusual broad magnetic continuum characteristic of fractionalization which — most remarkably — extends to energies below the lowest sharp magnon mode and to temperatures significantly higher than the magnetic ordering temperature.

11:15 **Coffee break**

Chairperson: Sergey STRELTSOV

11:45 *Arseny SYROMYATNIKOV*
C.I5 **BOND-OPERATOR FORMALISM FOR DISCUSSION OF EXOTIC PHASES AND ELEMENTARY EXCITATIONS IN SPIN-1/2 MAGNETS**

I present a bond-operator technique (BOT) which is suitable for description of both magnetically ordered and disordered states in spin-1/2 magnets as well as transitions between the phases. I discuss using BOT J1-J2 spin-1/2 Heisenberg antiferromagnet (HAF) on square lattice, nematic phases in frustrated 1D and 2D ferromagnets, and HAF on square lattice in magnetic field.

12:15 *Takanori SUGIMOTO*
C.I6 **CLUSTER-BASED HALDANE STATES IN QUANTUM SPIN CLUSTER CHAINS**

We theoretically study the Haldane state consisting of effective S=1 spins based on clusters, to extend our preceding research on naturally occurring mineral Fedotovite as an interesting example of the cluster-based Haldane state (CBHS). As exotic cases, we find several conditions and possible models to exhibit the CBHS with finite magnetization. Furthermore, we find that a spin chirality in a triangular tube can induce the CBHS with a quarter spin as an edge mode.

12:45 *Alexander OVCHINNIKOV*
C.O3 **ANOMALOUS TEMPERATURE BEHAVIOR OF THE CHIRAL SPIN HELIX IN $CrNb_3S_6$ THIN LAMELLAE**

Using Lorentz transmission electron microscopy and small-angle electron scattering techniques, we investigate the temperature-dependent evolution of a magnetic stripe pattern period in thin-film lamellae of the prototype monoaxial chiral helimagnet $CrNb_3S_6$. We found that the temperature behaviour reflects a three stage hierarchical behavior of melting in two dimensions.

13:00 *Dmitry DZEBISASHVILI*
C.O4 **QUANTUM OSCILLATIONS OF MAGNETIZATION IN ANTIFERROMAGNETIC SEMIMETALS ON A TRIANGULAR LATTICE**

It was shown that the well-known plateau in the field dependence of the localized spin magnetization in antiferromagnets on triangular lattice with S = 1/2, in fact, is not strictly horizontal, but is characterized by a weak positive slope. It was also established that at magnetic fields H_1 and H_2, corresponding to the boundaries of this plateau, due to strong *s–d* exchange coupling an abrupt change in the frequency of quantum oscillations of the itinerant electron magnetizat should be observed.

13:15 **Lunch time**

Chairperson: Alexander OVCHINNIKOV

15:00 *Alexander LICHTENSTEIN*
C.I7 **STRONG ELECTRONIC CORRELATIONS IN LOW DIMENSIONAL MAGNETIC SYSTEMS**

Effects of electron interactions in different materials, including transition metal magnetic impurity on Cu, Pt, TaO, and Graphene will be discussed.

15:30 *Marina POPOVA*
C.I8 **NEW LOW-DIMENSIONAL MAGNETICS OF THE LANGASITE FAMILY**

This talk focuses on the recently synthesized compounds $Ln_3CrGe_3Be_2O_{14}$ (Ln = La–Sm) as a new class of low-dimensional magnetics. They belong to a vast and interesting family of the so called langasites.

16:00 *Anatoly YERMAKOV*
C.I9 **DIMERIZATION AND LOW-DIMENSIONAL MAGNETISM OF NANOCRYSTALLINE MAGNETIC SEMICONDUCTORS TiO_2 DOPED BY Fe AND Co**

The report is devoted to a generalized analysis of the structural state and a discussion of the fundamental problem of the magnetism nature in nanocrystalline diluted magnetic semiconductors based on TiO_2 doped with 3*d*-metals. Analysis of the experimental data suggests the presence of noninteracting paramagnetic Fe^{3+} and Co^{2+} ions in the high-spin state and the set of antiferromagnetic dimers (Fe^{3+}–Fe^{3+}) and (Co^{2+}–Co^{2+}) with different negative exchange interactions.

16:30 *Aleksandr PETROV*
C.O5 **SIZE-EFFECT INFLUENCE ON THE MAGNETIC PHASE TRANSITION IN THE NANOMAGNETICS**

The simple approach (the ”average spin” method) was devised on the assumption with randomness of interaction fields between spin magnetic moments allowing one to study the influence of the size of diluted nanomagnets (nanoparticles and ultrathin films) and the concentration of “magnetic atoms” on the critical temperature and the behavior of magnetic susceptibility in the region of the magnetic phase transition.

16:45 *Kira VOSTRIKOVA*
C.O6 **CYANOMETALLATES IN DESIGN OF LOW-DIMENSIONAL MOLECULAR MAGNETS: PROMISES AND DISADVANTAGES**

In our report we will discuss the cyanometallates special features, which influence the different properties of the target heterometallic compounds. Among them: chemical stability, dimensionality, structure, uni-axial anisotropy, strength of the exchange magnetic interactions. On example of minutely studied Re(IV)-Mn(III) system, we will also demonstrate how it is possible to construct all 0÷3 dimensional molecular magnetic materials by self-assembling of the initial metal complexes.

17:00 *Marina ANDREEVA*
C.O7 **POLARIZATION SELECTION IN MÖSSBAUER REFLECTIVITY FOR MAGNETIC MULTILAYER INVESTIGATION**

Polarization selection of the reflected radiation has been employed in Mössbauer reflectivity measurements with a synchrotron Mössbauer source (SMS). The polarization of resonantly scattered radiation differs from the polarization of an incident wave so the Mössbauer reflectivity contains a scattering component with 90 rotated polarization relative to the -polarization of the SMS for some hyperfine transitions.

17:15 **Coffee break**

Section E. Magnetotransport, magnetooptics and magnetophotonics, Hall B

Chairperson: Vladimir GLUSHKOV

10:15 *Roman PISAREV*
E.I1 **UNCONVENTIONAL OPTICAL AND MAGNETO-OPTICAL PHENOMENA IN THE MAGNETOELECTRIC ANTIFERROMAGNET CuB_2O_4**

Optical absorption experiments were performed in the magnetoelectric antiferromagnet CuB_2O_4 in the spectral range from 1.4 to 2.5 eV in the temperature range from 1.7 to 300 K in the magnetic field B applied along the main crystallographic axes [100], [001] and for the light propagating along (Faraday geometry) and perpendicular (Voigt geometry) to the **B** field. The main task was to register the nonreciprocal optical absorption related to the magneto-spatial kB type effects.

10:45 *Vladimir BELOTELOV*
E.I2 **MAGNETOPHOTONIC STRUCTURES FOR ULTRAFAST OPTICAL CONTROL OF SPINS**

We demonstrate the ultrafast excitation of spins in all-dielectric iron-garnet nanogratings. The use of sub-wavelength gratings in iron-garnet films gives rise to the enhancement of opto-magnetic effects. In order to study the ultrafast magnetization dynamics we use the pump-probe technique, that allows us to probe a transient response of the structure at different wavelengths. In the area close to the waveguide resonance we detect a more than 3 time enhancement of the precession amplitude.

11:15 **Coffee break**

Chairperson: Viktor PAVLOV

11:45 *Vladimir GLUSHKOV*
E.I3 **ANOMALOUS HALL EFFECT IN THE MAGNETS WITH STRONG SPIN FLUCTUATIONS**

Some specific features of anomalous Hall effect (AHE) in the systems with strong spin fluctuations are considered. We argue that the linear AHE scaling on resistivity found in $Ho_{0.5}Lu_{0.15}B_{12}$, $Mn_{1-x}Fe_xSi$ ($0<x<1$) and $Eu_{1-x}Gd_xB_6$ ($x<0.04$) is related to asymmetric scattering due to spin fluctuations rather than to general skew-scattering model. The inconsistence of existing AHE theories to explain the experimental data for the systems with strong spin fluctuations is discussed.

12:15 *Ivan KARPOVSKY*
E.O1 **ULTRAFAST LASER-DRIVEN SPIN-REORIENTATION TRANSITION IN A MAGNETITE Fe_3O_4**

We demonstrate experimentally a possibility to trigger a spin-reorientation transition (SRT) in magnetite by femtosecond laser pulses. We observed laser-induced precession which is a manifestation of ultrafast SRT. The most intriguing result is that the ultrafast SRT is observed even at low fluences, which are insufficient for heating the sample above TSRT. This suggest that there is non-thermal contribution to laser-driven SRT.

12:30 *Andrey TELEGIN*
E.O2 **STRAIN-MAGNETO-OPTICS: NEW MAGNETO-OPTICAL PHENOMENA ASSOCIATED WITH MAGNETOELASTIC INTERACTIONS**

New giant magneto-optical effects in unpolarized light are found for a ferrimagnetic single-crystal of $CoFe_2O_4$ well below Curie temperature. It is shown that the influence of magnetic field on the optical properties of the ferrite with high magnetostriction is indirect in the sense that the field induces strong strain, which in turn leads to the change in the reflection and absorption.

12:45 *Vladimir GREBENNIKOV*
E.O3 **EFFECT OF ATOMIC MAGNETIC MOMENTS IN RESONANT X-RAY PHOTOEMISSION SPECTROSCOPY**

The interplay of *f*- and *d*-elements and its effect on the formation of the electronic structure in R–T compounds are studied. The resonant x-ray photoemission spectroscopy (RXPS) allows to select the contributions of the various components in the valence bands (VB). We can study not only the ground state, but also the lifetime of the excited (a core-level hole – VB electron) state, determine energies of the VB single-particle states and two-hole states at selected atoms.

13:00 *Tatyana MIKHAILOVA*
E.O4 **HYBRID STATES OF TAMM PLASMON POLARITONS IN NANOSTRUCTURES WITH Bi-SUBSTITUTED IRON GARNETS**

The work presents the results of investigation of hybrid states of amm plasmon polaritons (TPP) in different nanostructures based on Bi-substituted iron garnets and gold layers and nanoparticles. The hybrid states of TPP–Fabry-Perot and TPP–LSP were considered.

13:15 **Lunch time**

Chairperson: Vyacheslav MARCHENKOV

15:00 *Lev AGAFONOV*
E.O5 **THREE-DIMENSIONAL MAGNETO-OPTICAL IMAGING OF MAGNETIC DOMAIN STRUCTURES IN IRON GARNETS SINGLE CRYSTALS BY MEANS OF CONFOCAL RAMAN MICROSCOPY**

Currently there are few different method of three-dimensional visualization of the magnetization distribution but all of them have drawbacks that inflict significant limitations on domain structure (DS) visualization in bulk transparent samples. The suggested method allows to obtain three-dimensional distribution of the magnetization vector orientation in transparent samples without such limitations.

15:15 *Michael YAKUSHEV*
E.O6 **THE g-FACTOR OF THE TOPOLOGICAL INSULATOR $BiSbTe_2S$: A MAGNETO-OPTICAL STUDY**

We examine optical and electronic properties of $BiSbTe_2S$ single crystals using Fourie transform mid-infrared (MIR) transmission spectroscopy at high magnetic fields. A relatively sharp absorption band edge in zero field transmission spectra provides an opportunity to observe unusual effects generated by the magnetic field.

15:30 *Evgeny MASHKOVICH*
E.O7 **THz OPTO-MAGNETISM: NON-LINEAR EXCITATION OF SPIN WAVES IN ANTIFERROMAGNETIC $FeBO_3$**

We show that intense THz pulses efficiently trigger spin oscillations corresponding to two modes of the antiferromagnetic resonance in $FeBO_3$. While the q-AFM mode is resonantly excited by the magnetic field of the incident THz pulse, the q-FM mode is excited off-resonantly and its amplitude scales quadratically with the strength of the THz electric field. The mechanism of the excitation has all the features of the inverse opto-magnetic Cotton-Mouton effect.

15:45 *Victor PAVLOV*
E.O8 **HIGH-RESOLUTION OPTICAL SECOND-HARMONIC SPECTROSCOPY IN ANTIFERROMAGNETS ACCESSED BY FEMTOSECOND LASER TECHNIQUE**

We applied a high-resolution spectroscopy to the optical second harmonic generation (SHG) studies of antiferromagnets Cr_2O_3 and $KNiF_3$ by the femtosecond laser technique. The measurements were done in the spectral region close to narrow excitonic lines in absorption spectra of these magnetic dielectrics. Comprehensive studies of spectral, temperature, magnetic-field dependencies and rotational anisotropies of SHG revealed new nonlinear magnetic-field-induced contributions.

16:00 *Evgeny KARASHTIN*
E.O9 **THEORY OF LINEAR OPTICAL EFFECT IN MAGNETIC MEDIA WITH DZYALOSHINSKII-MORIYA INTERACTION**

We report a theoretical study of linear magnetooptical effects in a medium that is non-collinearly magnetized due to Dzyaloshinskii-Moriya interaction. The investigated effects are a result of an interplay between the spin texture and spin-orbit coupling. Two possibilities are considered: an effect caused by spatial dispersion of light in the presence of the spin Hall effect and an effect caused by Rashba coupling. The calculations show that the latter may be observed experimentally.

16:15 *Mikhail ZHURAVLEV*
E.O10 **NEW MECHANISM FOR LINEAR AND NON-LINEAR FARADAY AND KERR MAGNETOOPTIC EFFECTS**

We demonstrate that spin-orbit coupling alone — between the conducting electrons of ferromagnetic material and the electric field of light — provides the basis for Faraday and Kerr effects. Our calculations show that this new mechanism leads to the magneto-optical (MO) effects of the same magnitude as that of the ordinary mechanism. The linear and non-linear contributions are calculated. We discuss the possibility of the experimental detection of this of the new contribution to MO effects.

16:30 *Tatyana KUZNETSOVA*
E.O11 **X-RAY MAGNETIC CIRCULAR DICHROISM ON THE $N_{4,5}$ EDGES IN RARE EARTH FERROMAGNETS**

The report presents the results of our study of X-ray magnetic circular dichroism (XMCD) R $N_{4,5}$ absorption edge to measure the magnetic characteristics of R atoms.

16:45 *Irina KOLMYCHEK*
E.O12 **NONLINEAR MAGNETO-OPTICAL EFFECTS IN PLANAR STRUCTURES BASED ON HEAVY AND FERROMAGNETIC METALS**

In this paper we study the magnetic field induced effects in optical second harmonic generation that appear in planar structures composed of heavy (Pt, Ta) and ferromagnetic (Co) metals. The main idea is to visualize the effects of specific interface interactions induced by the composition of the structures, including possible formation of chiral magnetization distribution.

17:15 **Coffee break**

Section I. Magnetism and superconductivity, Hall C

Chairperson: Nataliya PUGACH

10:15 *Alexander MELNIKOV*
I.I2 **ELECTROMAGNETIC PROXIMITY EFFECT IN PLANAR SUPERCONDUCTOR-FERROMAGNET STRUCTURES**

The spread of Cooper pairs in a ferromagnet in proximity coupled superconductor-ferromagnet (S/F) structures is shown to cause a strong inverse electromagnetic phenomenon, namely, the long-range transfer of the magnetic field from the ferromagnet to the superconductor. The corresponding spontaneous currents in superconductor decay at the London penetration depth and appear even in the absence of the stray field of the ferromagnet in the normal state.

10:45 *Ludmila USPENSKAYA*
I.I3 **EDELSHTEIN AND DRESSELHAUS EFFECTS IN MAGNETIC DIELECTRIC/SUPERCONDUCTOR STRUCTURE**

Control of resistive properties of superconductor/ferromagnet hybrid structures by spin-polarized current is important for new branch of electronics — cryoelectronics. The experimental evidences of the existence of Edelshtein and Dresselhaus effects in magnetic dielectric/superconductor structure will be discussed. The role of the breaking symmetry for the superconducting layer, one surface of which is covered by magnetic layer and another is bordered on the vacuum.

11:15 **Coffee break**

Chairperson: Maxim KORSHUNOV

11:45 *Alexander MOSKVIN*
I.I4 **LARGE VARIETY OF THE ON-SITE ORDER PARAMETERS AND PHASE STATES IN QUASI-2D HTSC CUPRATES**

The origin of high-T_C superconductivity (HTSC) and other unconventional properties of cuprates is still a matter of great controversy mainly due to a complex interplay of charge, orbital, spin, and lattice degrees of freedom. We discuss the large variety of the on-site order parameters that explain both conventional and unconventional phase states in quasi-2D HTSC cuprates.

12:15 *Vadim SHESTAKOV*
I.O4 **INFLUENCE OF TEMPERATURE ON THE IMPURITY-INDUCED s+– -> s++ TRANSITION IN THE MULTIBAND MODEL OF Fe-BASED SUPERCONDUCTORS**

We study the dependence of the superconducting gaps on both the disorder and the temperature within the twoband model for ironbased materials. We show here that the impurity-induced s+– $\rightarrow$ s++ transition is temperature-dependent.

12:30 *Elena POPOVA*
I.O5 **FORMATION AND STRUCTURE OF Nb_3Sn LAYERS IN BRONZE-PROCESSED SUPERCONDUCTORS UNDER VARIOUS INTERMEDIATE HEAT TREATMENTS**

Multifilamentary Nb_3Sn-based wires are used in superconducting magnetic systems. The crucial role in high current-carrying capacity is played by the structure of Nb_3Sn layers, determined by fabrication route, composition, annealing schedules, etc. The superconducting layers formation studied after various regimes of intermediate heat treatments and diffusion annealing. This research reveals optimal regimes for perfect structure of superconducting layers ensuring the highest critical current.

12:45 *Yury KHAYDUKOV*
I.O6 **MAGNETIC PROXIMITY EFFECT IN Nb/Gd SUPERLATTICES**

We have used spin-polarized neutron reflectometry to investigate the magnetization profile of superlattices composed of ferromagnetic Gd and superconducting Nb layers. We have observed a partial suppression of ferromagnetic (F) order of Gd layers in $[Gd(d_F)/Nb(25nm)]_{12}$ superlattices below the superconducting (S) transition of the Nb layers which we explain by electromagnetic mechanism.

13:00 *Anton ZLOTNIKOV*
I.O7 **SPIN-CHARGE FLUCTUATIONS IN THE TOPOLOGICALLY NONTRIVIAL COEXISTENCE PHASE OF SUPERCONDUCTIVITY AND MAGNETIC ORDERING**

In this work we show that quantum spin and charge fluctuations strongly renormalize the magnetic order parameter in the 2D correlated system with a triangular lattice, but do not destroy the coexistence phase of chiral d+id superconductivity and 120-degree spin ordering. The nontrivial topology of the coexistence phase is also preserved.

13:15 **Lunch time**

Chairperson: Ludmila USPENSKAYA

15:00 *Yuri SKRYABIN*
I.I5 **ORBITAL MAGNETIC CORRELATIONS, TOPOLOGICAL ORDER AND SUPERCONDUCTIVITY IN STRONGLY CORRELATED SYSTEMS**

Topological nature of Mott-Hubbard systems and corresponding magnetic, spin-liquid and superconducting states are treated. The influence of chirality and orbital degrees of freedom is investigated.

15:30 *Nataliya PUGACH*
I.O8 **SUPERCONDUCTING SPIN VALVES BASED ON SPIRAL MAGNETS**

We propose a superconducting spin-triplet valve, which consists of a superconductor and an itinerant magnetic material, with the magnet showing an intrinsic non-collinear order characterized by a wave vector that may be aligned in a few equivalent preferred directions under the control of a weak external magnetic field. Re-orienting the spiral direction allows one to controllably modify long-range spin-triplet superconducting correlations, leading to spin-valve switching behavior.

15:45 *Irina BOBKOVA*
I.O9 **MAGNETOELECTRIC EFFECTS IN S/F AND S/AF HYBRIDS AND JOSEPHSON DETECTION OF MAGNETIZATION DYNAMICS**

It is demonstrated that in S/F/S Josephson junctions with spin-textured ferromagnets the magnetoelectric effect, which takes the form of the anomalous ground phase shift, is a manifestation of a generic supercurrent-mediated interaction between localized spins. It is shown that in the presence of magnetization dynamics such systems become inherently dissipative and in principle cannot sustain any amount of the superconducting current. We have also demonstrated that the inverse magnetoelectric effect exists in S/AF/S Josephson junctions in the presence of SO-coupling.

16:00 *Lev MAZOV*
I.O10 **THE KEY ROLE OF AF SDW STATE FOR HTSC IN CUPRATES AND PNICTIDES**

It is demonstrated that magnetic (AF SDW) phase transition, preceding SC one in copper oxides, provides rise of T_C due to both: rise of DOS at edges of dielectric gap (pseudogap) under partial dielectrization of Fermi surface and rise of SC-pairing energy ($\sim$2 eV) due to planar CT-excitons, moving through lattice in CuO_2-plane without disturbance of AF spin background. Such CT-excitons persist under doping in semi-insulating, spin stripes (AF domains) alternating with conducting, charge ones (domain walls) ($\sim$1 nm) — planar “Ginzburg sandwich”. Similar picture is in iron-based HTSC.

16:15 *Evgueni TALANTSEV*
I.O11 **CLASSIFYING SUPERCONDUCTIVITY IN MAGIC ANGLE TWISTED BILAYER GRAPHENE**

Intrinsic superconductivity was observed in the magic-angle twisted bilayer graphene (MATBG) recently. Here, we analyse experimental data for the upper critical field and the self-field critical current and found that the existing experimental data excludes the pure d-wave and with very high probability d+id symmetries from further consideration. s-wave and one of four p-wave symmetries are likely in the MATBG. Regardless, MATBG is moderately strong coupled superconductor.

16:30 *Airat KIIAMOV*
I.O12 **MÖSSBAUER SPECTROSCOPY STUDY OF THE MAGNETIC MICROSTRUCTURE OF $Fe_{1.05}Te_{(1-X)}Se_X$**

In the present study we consider a magnetic state of three compounds of the series $Fe_{1+Y}Te_{(1-X)}Se_X$ with the same iron stoichiometry: $Fe_{1.05}Te$, $Fe_{1.05}Te_{0.6}Se_{0.4}$ and $Fe_{1.05}Te_{0.7}Se_{0.3}$ by means Mössbauer spectroscopy.

17:15 **Coffee break**

Section D. Domain walls, vortices and skyrmions, Hall A

Chairperson: Oleg TRETIAKOV

10:15 *Alexander SAMARDAK*
D.I1 **SKYRMIONS AND SKYRMION LATTICE IN ULTRATHIN "HEAVY METAL/FERROMAGNET" FILMS**

In this work, we present the results on nucleation of stable skyrmions and the formation of a skyrmion lattice by means of magnetic force microscopy (MFM) in Pt/CoFeSiB/W multilayers.

10:45 *Alexey OGNEV*
D.O1 **SIMULTANEOUS CONTROL OF PMA AND iDMI BY FOCUSED ION BEAM IRRADIATION IN MAGNETIC THIN FILMS**

In this paper, we report the manipulation of magnetic properties in ultrathin Ru/Co/W/Ru films with strong iDMI and PMA using a focused Ga+ ion beam (FIB) for the spatially resolved irradiation. Effect of this modification reflected on the domain structure. The presented spatially resolved modification of ultrathin films can be potentially used for creations of artificial neuromorphic devises and skyrmion-based logics exploiting the locally gradient-tuned PMA and/or iDMI.

11:00 *Roman MORGUNOV*
D.O2 **SPONTANEOUS QUASIPERIODICAL MAGNETIZATION REVERSAL IN SPIN VALVES WITH PERPENDICULAR ANISOTROPY**

The spontaneous long periodic $\sim$1h oscillations of magnetization reversal (SLOMR) in constant magnetic field were revealed in Pt/Co/Ir/Co/Pt perpendicular synthetic antifferomagnet by SQUID and MOKE techniques. The SLOMR is caused by DMI interaction between reversal nucleas of different types. Time-domain analysis of the the SLOMR based on the dynamical system of differentional equations equivalent to simple Schrödinger equation allowed one to extract basic physical parameters.

11:15 **Coffee break**

Chairperson: Michael FOERSTER

11:45 *Levente RÓZSA*
D.I2 **DAMPING OF SPIN WAVE MODES IN MAGNETIC SKYRMIONS**

The frequencies and lifetimes of localized magnon modes are calculated in magnetic skyrmions. The enhancement of the effective damping parameters compared to the Gilbert damping is discussed. The characteristics of spin waves close to the low and high instability fields of isolated skyrmions are investigated.

12:15 *Alexander PYATAKOV*
D.I3 **ELECTRIC FIELD AS AN ACTOR IN MICROMAGNETISM**

The electric field induced effects on magnetic domain structure are reviewed: the buble domain nucleation, the domain wall propagation and other intriguing phenomena.

12:45 *Rudolf SCHAEFER*
D.I4 **IMAGING OF MAGNETIC DOMAIN DYNAMICS AT POWER FREQUENCY**

A magneto-optical indicator film with perpendicular anisotropy (PMOIF) is used for time-resolved domain imaging on transformer steel. The high sensitivity of the PMOIF allows for single-shot imaging at power frequency, even in the presence of insulation coatings. Differences between quasistatic and dynamic processes are elaborated, revealing the mechanisms of domain refinement and showing the role of grain boundaries and mechanical stress on domain formation and flux propagation.

13:15 **Lunch time**

Chairperson: Alexander PYATAKOV

15:00 *Nikolai KISELEV*
D.I5 **2D AND 3D MAGNETIC TEXTURES WITH PARTICLE-LIKE PROPERTIES**

I will present the most recent theoretical and experimental results on the two dimensional (2D) and three dimensional (3D) localized magnetic textures with particle-like properties which go beyond the well studied radially symmetric magnetic skyrmions with topological charge |Q|=1.

15:30 *Michael FOERSTER*
D.I6 **FIELD- AND CURRENT-DRIVEN DOMAIN WALL DYNAMICS IN CYLINDRICAL NANOWIRES**

Theory predicted that domain wall dynamics in cylindrical nanowires is drastically different from that in flat nanostrips, suffering no Walker breakdown. However, experiments so far addressed mostly flat strips. Here we report experimental results for both the field- and the current-driven cases, bringing a mixture of confirmation of predicted effects, and new physics so far overlooked related to the transformation (or not) of the topology of the walls during motion.

16:00 *Aleksandr DAVYDENKO*
D.O3 **MAGNETIC STRUCTURE OF [Co(0.8–1.6 nm)/Pd(2 nm)]$_5$ SUPERLATTICES WITH INTERFACIAL DZYALOSHINSKII-MORIYA INTERACTION**

Magnetic properties of the [Co/Pd(111)]$_5$ crystalline superlattices were investigated depending on the Co layers thickness. We experimentally observed strong Dzyaloshinskii-Moriya interaction and perpendicular magnetic anisotropy in the [Co/Pd(111)]$_5$ symmetric superlattices. We showed that magnetic structure, period of stripe domains and size of skyrmions may be controlled by choosing appropriate thickness of Co layers in the [Co/Pd(111)] superlattices.

16:15 *Mikhail LOGUNOV*
D.O4 **THERMAL AND NON-THERMAL EFFECTS IN LASER-INDUCED INERTIAL DOMAIN-WALL DYNAMICS**

An experimental study of domain-wall (DW) motion in garnet film induced by single laser pulse is reported. The helicity change of the laser pulse changes the direction of DW motion. Maximum DW displacement depends on laser wavelength and it correlates with the magnetic circular dichroism spectrum. We experimentally measured the laser-induced local sample temperature increase. This made it possible to isolate the helicity-dependent DW motion, eliminating the thermal effect.

16:30 *Anton RASKOVALOV*
D.O5 **SOLITONS IN THE DOMAIN STRUCTURE OF AN EASY-AXIS FERROMAGNET**

New solitons strongly associated with the stripe domain structure of an easy-axis ferromagnet are found by the inverse scattering technique and are analyzed in detail. Generation of the solitons in the structure from an initial localized perturbation of magnetization is discussed.

16:45 *Ksenia CHICHAY*
D.O6 **EFFECT OF INTERPLAY OF DZYALOSHINSKII-MORIYA AND DIPOLAR INTERACTIONS ON INTERNAL SKYRMION STRUCTURE IN MAGNETIC MULTILAYERS**

In this work we investigate the stability and internal structure of an isolated Skyrmion in bilayer (ferromagnet/heavy metal) and trilayer (heavy metal 1/ferromagnet/heavy metal 2) nanodisks. We study the static properties of the Skyrmions and obtain the phase diagrams of the Skyrmion existence depending on the thickness of the ferromagnetic layer and the DMI strength.

17:15 **Coffee break**

Section K. Magnetic semiconductors, multiferroics, topological insulators, Hall E

Chairperson: Vladimir GUDKOV

11:45 *Holger MEYERHEIM*
K.I1 **MAGNETISM, ELECTRONIC AND GEOMETRIC STRUCTURE OF ULTRA-THIN TRANSITION METAL DICHALCOGENIDES PREPARED BY INTERFACE REACTION WITH Bi_2Se_3**

In this talk I will discuss the preparation and investigation of ultra-thin FeSe, and $TaSe_2$ films grown by an interface reaction of the corresponding metals with Bi_2Se_3(0001) single crystal surfaces. High quality films areas found by surface x-ray diffraction, x-ray absorption fine structure and scanning tunnelling microscopy experiments. The film electronic structure was studied by spin- and momentum-resolved photoemission spectroscopy and scanning tunnelling spectroscopy.

12:15 *Mikhail OTROKOV*
K.I2 **ANTIFERROMAGNETIC TOPOLOGICAL INSULATORS: PREDICTION FROM FIRST PRINCIPLES, OBSERVATION, AND APPLICATIONS**

This talk is about a recent ab initio prediction and experimental realization of the first antiferromagnetic topological insulator (AFMTI) $MnBi_2Te_4$. While the existence of an AFMTI was first predicted in 2010 based on general considerations, there was no experimental confirmation because of the lack of solid theoretical proposals of the candidate materials. Apart from $MnBi_2Te_4$, other AFMTI candidates will also be discussed in this talk as well as the AFMTIs practical applications.

12:45 *Zoya KUN'KOVA*
K.I3 **MAGNETO-OPTICAL DETECTION OF INTRINSIC FERROMAGNETISM AND PHASE SEPARATION IN DILUTED MAGNETIC SEMICONDUCTORS**

Modern costly techniques of structural and magnetic characterization being used for confirming intrinsic (IFM) ferromagnetism of diluted magnetic semiconductors (DMS) are not always available. We show the efficiency of magneto-optical spectroscopy for this aim by the example of Ga(In)MnAs study. We measured transversal Kerr effect (TKE) spectra, temperature and magnetic field TKE dependences, ellpsometry spectra. We confirmed IFM of DMS and detected magnetic and phase inhomogeneity in them.

13:15 **Lunch time**

Chairperson: Yuri FETISOV

15:00 *Zukhra GAREEVA*
K.I4 **CYCLOIDAL ORDERING IN MULTIFERROIC FILMS**

We explore the mechanisms responsible for non-collinear spin ordering in multiferroics, analyze the conditions required for stabilization of cycloidal magnetic states and highlight the differences between spin cycloids in single crystals and films. We focus on $BiFeO_3$-like multiferroics, due to the Dzyaloshinskii-Moriya interaction supported by electric polarization in $BiFeO_3$, a tendency to form long periodical structures always exists in these compounds.

15:30 *Oleg UDALOV*
K.O1 **MAGNETO-ELECTRIC EFFECT IN GRANULAR MULTIFERROICS**

Novel type of magnto-electric coupling in granular multiferroics materials is considered. In granular multiferroic one has ferromagnetic metal grains embedded into a ferroelecric insulatig matrix. We show that we can tune the exchange interaction between magnetic grains using external electric field. Theory of the effect as well as experimntal demonstration are presented in the work.

15:45 *Lukas WEYMANN*
K.O2 **MAGNETIC STRUCTURE AND MAGNETOELECTRICITY IN HOLMIUM-DOPED LANGASITE**

In this work we present the results of a magnetoelectric effect, i.e. electric polarization induced by an external magnetic field, in the diluted rare-earth langasite $(La_{2.91}Ho_{0.09})Ga_5SiO_{14}$. This effect has an unusual angular dependence, which can be explained by taking into account the three-fold symmetry of the crystal and its rather complex magnetic structure.

16:00 *Anatolii PANKRATS*
K.O3 **MAGNETIC AND THERMODYNAMIC PROPERTIES AND SPIN-FLOP-DRIVEN MAGNETODIELECTRIC RESPONSE OF THE ANTIFERROMAGNETIC $Pb_2Fe_2Ge_2O_9$ SINGLE CRYSTALS**

$Pb_2Fe_2Ge_2O_9$ single crystals were grown using a pseudo-flux technique. Weak ferromagnetism arises due to single-ion anisotropy and Dzyaloshinskii–Moria mechanisms. The principal magnetic anisotropy directions coincide with the orthorhombic axes. Most prominent magnetodielectric response was observed in $Pb_2Fe_2Ge_2O_9$ at the spin-flop transition.

16:15 *Jan GOSPODARIC*
K.O4 **BAND STRUCTURE OF THE 3D HgTe QUANTUM WELL FROM THE CYCLOTRON RESONANCE**

We present a method to obtain insight into the band dispersion of samples with a surrounding layered structure by optically probing the cyclotron resonance of the free carriers in a thin film of three-dimensional topological insulator HgTe. Specifically, we applied our measuring procedure to a strained 80 nm thick HgTe quantum well, which is insulating in the bulk and is characterized by a 2D surface electron gas with a Dirac-like dispersion.

16:30 *Sergey APLESNIN*
K.O5 **MAGNETORESISTANCE AND MAGNETOIMPEDANCE IN $Lu_xMn_{1-x}S$ SOLID SOLUTIONS PARAMAGNETIC STATE**

Magnetoresistance and magnetoimpedance $Lu_xMn_{1-x}S$ solid solutions change sign for concentrations above percolation concentration (x_c) in the FCC lattice in paramagnetic state. For $x < x_c$, the hysteresis of the electric polarization was found. Polarization is associated with charge accumulation at the Lu–S–Mn interface. The results are explained in terms of formation of chemical electron phase separation.

16:45 *Vladimir MEN'SHENIN*
K.O6 **MAGNETIC PHASE TRANSITIONS AND ELECTRIC POLARIZATION IN RMn_2O_5 OXIDES**

The compounds were investigated intensively in the last twenty years in which the ordering of different nature coexists. The RMn_2O_5 oxides belong to such systems. There is a strong interaction between magnetic and ferroelectric subsystems in these compounds. It was studied the magnetic phase transitions from paramagnetic to magnetic structure in these oxides based on renormalization group analysis. It was found the conditions of an appearance of the electric polarization with such transitions.

17:15 **Coffee break**

FRIDAY, 13.09.2019

Section C. Low dimensional magnetism, Hall A

Chairpersons: Marina POPOVA, Anatoly YERMAKOV

9:30 *Daniel BÜRGLER*
C.I10 **QUANTUM INTERFERENCE EFFECTS IN MOLECULAR SPIN HYBRIDS**

Molecular spin hybrids formed upon chemisorbing a polyaromatic molecule on Co(111) nanoislands are studied by STM. Spin-dependent hybridization between Co *d*-states and molecular π-orbitals leads to a spin-imbalanced molecular electronic structure. Spin-resolved data show different spin polarization on the aromatic rings in spite of the symmetric adsorption geometry. This is explained by the spatially modulated spin polarization of the quantum interference pattern of the Co(111) surface state.

10:00 *Iuliia NOVOSELOVA*
C.O8 **MAX PHASES AS A NOVEL CLASS OF MAGNETIC MATERIALS**

A review of a comprehensive study exploring magnetic phase transitions, structural transformations, electrical transport, magnetic properties and thickness dependence of the magnetic nanolaminated Mn-based carbide films Mn_2GaC and $(Cr_{0.5}Mn_{0.5})_2GaC$, which possess MAX phase structure. Exceptional properties were observed, for instance, a sign reversal of the large uniaxial magnetostriction across the magneto-structural phase transition and weak thickness dependence of the magnetism.

10:15 *Marina BOLDYREVA*
C.O9 **NON-EQUILIBRIUM CRITICAL BEHAVIOR OF MULTILAYER MAGNETIC NANOSTRUCTURES**

A Monte Carlo simulation of the non-equilibrium behavior of multilayer magnetic nanostructure is carried out. It is shown that, in contrast to bulk magnetic systems, the aging effects in nanostructure arise not only at the ferromagnetic ordering temperature T_C but also within a wide temperature range at $T \leq T_C$. Simulation of transport properties in multilayer structure permitted to calculate non-equilibrium values of magnetoresistance.

10:30 *Pavel PRUDNIKOV*
C.O10 **AGING AND HYSTERESIS EFFECTS IN CRITICAL BEHAVIOR OF MULTILAYER MAGNETIC NANOSTRUCTURES**

Magnetic order in the multilayers is complex due to a strong influence of the shape and the magnetocrystalline anisotropies of the sample. This study includes the Monte-Carlo simulation of the nonequilibrium critical evolution from different initial states of low-dimensional magnetics and multilayers based on anysotropic Heisenberg films. Aging effects and hysteresis loops were revealed in behavior of magnetic multilayered structure.

10:45 *Vladimir GORNAKOV*
C.O11 **PERPENDICULAR EXCHANGE BIAS IN THE "FERRIMAGNETIC/ANTIFERROMAGNETIC" HETEROSTRUCTURE**

The unidirectional anisotropy and transformation of the magnetic structure in the GdFeCo ferrimagnetic film exchange-coupled with the antiferromagnetic IrMn are studied in a wide temperature range. Ta/Pt/GdFeCo/IrMn/Pt multilayer structure with perpendicular magnetic anisotropy demonstrates the magnetization compensation at $T_C \approx 120$ K. An orientational phase transition at a critical temperature $T_{CR} \approx 35$ K was found.

11:00 *Maksim SAPOZHNIKOV*
C.O12 **MAGNETIC RESONANCE FORCE MICROSCOPY OF FERROMAGNETIC NANOSTRUCTURES**

Ferromagnetic resonance (FMR) of individual permalloy microstripe is investigated by magnetic resonance force microscopy (MRFM). Three resonant dips in the MRFM spectrum are observed, the lateral shift of the probe according to the sample leads to consequent transformation of the dips into peaks. The change of the contribution of the same FMR mode in the spectrum is explained by the change of the phase between magnetic and nonmagnetic probe-sample interaction.

11:15 *Tobias POHLMANN*
C.O13 **CATION-SPECIFIC MAGNETIC DEPTH PROFILES IN ULTRATHIN Fe_3O_4 FILMS OBTAINED BY XRMR**

We measured magnetic depth profiles of Fe_3O_4/MgO films by X-Ray Magnetic Reflectometry at 3 resonant energies. For the Fe^{3+} cations an enhanced magnetisation layer near the surface is observed, while for the Fe^{2+} cations the magnetisation is homogeneous across the film. We try to link this finding with reports about an increasement of the magnetic moments in Fe3O4 films with decreasing thickness.

11:30 *Nikita KULESH*
C.O14 **HYSTERESIS PROPERTIES AND PERPENDICULAR MAGNETIC ANISOTROPY IN GdCo FILMS WITH HEXAGONAL ANTIDOT LATTICE**

In this work we used GdCo amorphous antidot films as a model system to study the influence of the antidot lattice on magnetic anisotropy and magnetization processes paying special attention to the material's distribution in the vicinity of the pores.

Section G. Frustrated and disordered magnetism, Hall B

Chairperson: Leonid SVISTOV

9:30 *Peter PRELOVSEK*
G.I4 **SPIN LIQUID STATE IN PLANAR HEISENBERG MODELS**

In the talk I will present recent theoretical results of thermodynamical quantities within the extended Heisenberg model on triangular and kagome lattices and discuss the similarities and differences between spin-liquid states appearing in such models. The central quantity will be the modified Wilson ratio which can serve also as the experimental test for spin liquids in real materials.

10:00 *Felix KASSAN-OGLY*
G.O1 **ISING MODEL ON PLANAR DECORATED LATTICES. FRUSTRATIONS AND THEIR AFFECTION ON PHASE TRANSITIONS**

Ising model on different planar decorated lattices (square, triangle, hexagonal, kagome) with different exchange interactions signs was examined. Exact analytical expressions for a partition function was derived.

10:15 *Alexander SMIRNOV*
G.O2 **COMPETITION OF STATIC AND DYNAMIC DISORDER IN A TRIANGULAR ANTIFERROMAGNET $RbFe(MoO_4)_2$**

We observe disappearance of the 1/3 magnetization plateau and a striking change of the magnetic configuration under a doping of a triangular antiferromagnet. The reason is an effective lifting of degeneracy of mean-field ground states by a random potential of impurities, which makes the fluctuation contribution to free energy ineffective. These results provide a direct experimental confirmation of the fluctuation origin of the ground state in a real frustrated system.

10:30 *Svetlana SOFRONOVA*
G.O3 **HEAT CAPACITY, STRUCTURAL AND MAGNETIC PROPERTIES OF MIXED-VALENCE $Pb_3(Mn,Cu)_7O_{15}$**

$Pb_3(Mn_{1-x},Cu_x)_7O_{15}$ crystals belong to the hexagonal space group *P*63/*mcm*. Since the Mn2 (8h) sites in the structure are fully substituted by Cu all manganese ions have the valence 4+. The temperature of long-range magnetic order decreases to 60 K, but the temperature of reorientation of a magnetic moment increases to 30 K.

10:45 *Andrei GUBKIN*
G.O4 **FIELD-INDUCED MAGNETIC PHASE TRANSITIONS AND METASTABLE STATES IN Tb_3Ni**

In this work, we report a comprehensive study of the magnetic phase diagrams, low-temperature magnetic structures, short-range magnetic order and magnetic field effects on the magnetic state and electrical resistivity of Tb_3Ni performed by means of neutron scattering, magnetic and magnetoresistance measurements on the single crystal and powder samples.

11:00 *Evgeniia VAVILOVA*
G.O5 **MAGNETIC ORDERING PROCESS AND PHASE DIAGRAM OF A HONEYCOMB LATTICE COMPOUND $InCu_{2/3}V_{1/3}O_3$ VIA MAGNETORESONANCE TECHNIQUE STUDY**

11:15 *Artyom VAULIN*
G.O6 **INVESTIGATION OF INCOMMENSURATE MAGNETIC STRUCTURE OF Ho_7Rh_3 USING SUPERSPACE FORMALISM**

In this work, a neutron diffraction study of the incommensurate magnetic structure of the polycrystalline compound Ho_7Rh_3 was performed in the framework of the superspace formalism.

Section K. Magnetic semiconductors, multiferroics, topological insulators, Hall C

Chairperson: Mikhail OTROKOV

9:30 *Yuri FETISOV*
K.I4 **NONLINEAR MAGNETOELECTRIC EFFECTS IN LAYERED FERROMAGNETIC-PIEZOELECTRIC STRUCTURES**

The paper discribes nonlinear magnetoelectric effects (generation of harmonics, mixing of magnetic and electric fields, supression of hysteresis, bistability, parametric generation etc) which are observed in composite structures containing mechanically copled ferromagnetic, piezoelectric land electrostrictive layers. The effects arise due to nonlinearity of magnetostriction and electrostriction of the layers. Possible applications of the effects are discussed.

10:00 *Mikhail EREMIN*
K.I5 **MAGNETOELECTRIC COUPLING IN NONCOLLINEAR FERRIMAGNETS**

The analytical expressions for the magnetoelectric coupling derived using perturbation theory, combining the action of odd crystal field, spin–orbit and exchange interactions. Mainly I will focus on FeV_2O_4 and $LiCu_2O_2$.

10:30 *Svetlana EFREMOVA*
K.O7 **OBSERVATION OF THE INVERSE MAGNETOELECTRIC EFFECT IN PZT/FINEMET TWO-LAYERED COMPOSITE STRUCTURES**

The measurements of the inverse magnetoelectric (ME) effect in a two-layered FeSiBNbCu/$Pb(Zr,Ti)O_3$ (Finemet/PZT) sample were performed employing magnetooptical method. To observe the effect, magnetization curves of the amorphous Finemet ribbon were measured in the presence of the electric field applied to the PZT plate. It was revealed that the inverse ME effect has different signs at different orientations of the external magnetic field applied to the Finemet ribbon.

10:45 *Alexander MUKHIN*
K.O8 **EFFECT OF ELECTRIC FIELD ON MAGNETIZATION AND MAGNETIC SUSCEPTIBILITY IN RARE-EARTH FERROBORITE MULTIFERROICS**

We observed a strong effect of electric field **E** on magnetic properties in easy plane $SmFe_3(BO_3)_4$ possessing the largest spontaneous electric polarization among ferroborites. Qualitative transformations of magnetization curves were revealed in the applied **E** depending on its sign which accompanied changes in magnetic susceptibility up to 200%. The results are explained by a competition of the magnetoelectric contribution to the easy plane anisotropy with magnetoelastic, Zeeman and other counterparts.

11:00 *Vladimir GUDKOV*
K.O9 **JAHN-TELLER EFFECT IN ACOUSTIC PROPERTIES OF TITANIUM DOPED $BaFe_{12}O_{19}$ HEXAFERRITE SINGLE CRYSTALS**

Ti doped $BaFe_{12}O_{19}$ hexaferrite single crystal was studies by means of ultrasonic technique. Temperature dependence of velocity and attenuation of mode related to the c44 modulus revealed anomalies of relaxation origin at about 80 K. They were interpreted as manifestation of the Jahn-Teller effect by the tetrahedral $Fe^{2+}O_4$ complexes. Magnitudes of linear and quadratic vibronic coupling constants and parameters of the adiabatic potential energy surface were obtained from the experimental data.

11:15 *Guolei LIU*
K.O10 **FERROELECTRIC POLARIZATION CONTROLLED ANOMALOUS HALL EFFECTS AND MAGNETORESISTANCE IN FERROMAGNETIC SEMICONDUCTORS (Zn, Co)O**

The ferroelectric controlled anomalous Hall effects (AHE) and magnetoresistance (MR) were operated in a hybrid multiferroic field effect transistor by consisting of ferromagnetic semiconductor (Zn,Co)O layer and ferroelectric PMN-PT back gating layer. By applying gating voltage, a distinct and non-volatile variation for both AHE and hysteresis MR are observed through ferroelectric polarization driven charge depletion and accumulation.

11:30 *Alexander EDSTRÖM*
K.O11 **GIANT MAGNETOELECTRIC RESPONSE AND CROSS-CALORIC EFFECT AROUND A TETRACRITICAL POINT IN MULTIFERROIC $SrMnO_3$**

We use first principles calculations and Landau theory to explore the large magnetoelectric effects found around a tetracritical point in the strain-temperature phase diagram of $SrMnO_3$. In particular, we study a magnetoelectric cross-caloric effect, which is found to enhance the electrocaloric effect by 50%.

Section J. Soft and hard magnetic materials, Hall D

Chairperson: Nikolai BARANOV

9:30 *Arcady ZHUKOV*
J.I6 **STRESS-INDUCED MAGNETIC ANISOTROPY ENABLING ENGINEERING OF MAGNETIC SOFTNESS GMI EFFECT AND DOMAIN WALL DYNAMICS OF AMORPHOUS MICROWIRES**

We present our recent experimental results on influence of stress-annealing on magnetic properties, magnetoimpedance (GMI) effect and domain wall (DW) propagation of Fe- and Co-rich microwires. We observed remarkable magnetic softening, DW velocity and GMI ratio improvement at appropriate stress-annealing conditions in studied microwires. Consequently, stress annealing enabled us to design the magnetic anisotropy distribution beneficial for optimization of of GMI effect and DW dynamics.

10:00 *Nikolay MUSHNIKOV*
J.O8 **MAGNETIC PROPERTIES OF NON-STOICHIOMETRIC 4f–3d INTERMETALLIS**

It was found recently that 4f-3d intermetallic compounds can form non-stoichiometric compositions, which expands the opportunity to finely tune their properties. We report the results of our study of magnetic, magnetoelastic and magnetothermal properties of the non-stoichiometric compounds with the $MgCu_2$ and $CaCu_5$ structures.

10:15 *Aleksandr PIROGOV*
J.O9 **MAGNETIC PHASE TRANSITION IN $Tb_{0.9}Er_{0.1}Ni_5$**

Intermetallic compounds of the RNi_5 type (where R is a rare earth ion) and their substitutional derivatives have been extensively studied in view of a wide variety of properties of these compounds. In this report we present results of powder neutron diffraction on $Tb_{0.9}Er_{0.1}Ni_5$ compound. We have been carried out experiments on high resolution powder diffractometer with neutron length 1.834 Åover temperature interval (3–30) K, under external magnetic fields up to 8 kOe.

10:30 *Alexander ERMOLENKO*
J.O10 **COMPOSITIONAL GENESIS OF PARAMAGNETISM-FERROMAGNETISM TRANSITION IN $PrNi_{(2-x)}Co_{(x)}$ ALLOYS**

The crystal structure and magnetic properties of $PrNi_{(2-x)}Co_{(x)}$ pseudobinary alloys have been studied in detail. It is shown that continuous row of solid solutions there exists in whole range of x between 0 and 2. The Co atoms have magnetic moments about 0.5 Bor magneton at all x values. The ferromagnetic ordering at T = 2 K was observed already at x = 0.4. The Curie temperatures grow from 5 K to 41 K while x anges from 0.4 to 2. The experiment and calculations are well agree.

10:45 *Nadezhda KOSTYUCHENKO*
J.O11 **HIGH-FIELD MAGNETIZATION OF THE $ErFe_{11}Ti$ INTERMETALLIC WITH LOW RARE-EARTH CONTENT**

We report on a magnetization study of $ErFe_{11}Ti$ single crystal. Magnetization curves were obtained experimentally in fields up to 58 T at 4.2 K along the main crystallographic axes. Further, the magnetization curves for $ErFe_{11}Ti$ have been calculated. The full transition from ferri- to ferromagnetic state has been predicted theoretically using obtained crystal-field and exchange parameters.

11:00 *Oksana GOLOVNIA*
J.O12 **MAGNETIC PROPERTIES AND STRUCTURE OF MELT-SPUN Fe–Pd–P**

A detailed study of effects of P addition on the phase transformation, microstructure, and magnetic hysteresis properties of the melt-spun ribbons of $Fe_{59-x}Pd_{41}P_x$ (x = 9, 12, 15, 18) is presented. The additions of P to the FePd alloy allowed us to achieve the coercivity of 1.8 kOe. The preliminary results for the melt-spun $Fe_{59-x}Pd_{41}P_x$ (x = 9, 15) alloys subjected to high-pressure torsion demonstrate that even higher hysteresis properties can be achieved.

Section N. Magnetic non-destructive testing, Hall A
Chairperson: Yakov SMORODINSKII, Vladimir KOSTIN

FRIDAY

9:30 *Sergey ZADVORKIN*
N.I1 **MAGNETIC STRUCTURAL ANALYSIS OF CONSTRUCTIONAL MATERIALS AND PRODUCTS**

10:00 *Evgeny SERBIN*
N.O1 **COMPLEX APPLICATION OF MAGNETIC AND MAGNETOACOUSTIC PARAMETERS IN THE STRUCTUROSCOPY OF FERROMAGNETIC MATERIALS**

Use of only magnetic testing parameters to ensure an objective assessment of the structural-phase state of ferromagnetic materials is often not sufficient. Additional information can be given by parameters that are sensitive to the interaction of moving domain boundaries with defects of the crystalline structure. Such parameters are the characteristics of magnetoacoustic emission, which is the phenomenon of the appearance of elastic vibrations in a ferromagnet upon its magnetization reversal.

10:15 *Sergei SHCHERBININ*
N.O2 **MAGNETOIMPEDANCE-BASED LOW FIELD DETECTOR PROTOTYPE: FOCUS ON BIOMEDICAL CONDITIONS**

A compact thin film based magnetoimpedance detector of weak magnetic fields, operating at a frequency of up to 100 MHz was developed and tested. The sensitivity of the sensor to the applied magnetic field reaches 2 Ohms/Oe, which makes it possible to detect magnetic fields of the order of tens of μOe.

10:30 *Alexey MIKHAYLOV*
N.O3 **HIGHLY EFFECTIVE SYSTEM FOR EXCITATION AND RECEPTION OF LAMB WAVES IN FERROMAGNETS**

This paper is devoted to the development of the emitter-receiver system for non-destructive testing of ferromagnetic products with an increased efficiency of EMA conversion and without most of the EMA method's disadvantages.

10:45 *Andrey NIKITIN*
N.O4 **IDENTIFICATION OF DEFECTS IN A FERROMAGNET BY SOLVING THE INVERSE PROBLEM OF MAGNETOSTATICS**

The proposed work contains an algorithm for the realization of the recovery of the shape of defects by a measured magnetic field.

11:00 *Yuri REUTOV*
N.O5 **THE REASON OF OCCURRENCE OF A LONGITUDINAL RESIDUAL INDUCTION STEEL CORE AFTER CIRCULAR MAGNETIZATION**

The reason for the occurrence of longitudinal residual induction of the steel rod after its circular magnetization is explained.

11:15 *Anastasia NOVOSLUGINA*
N.O6 **MAIN FEATURES OF DISTRIBUTIONS OF THE MAGNETIC FLUX LEAKAGE FIELDS OF DEFECTS DIFFERENT SHAPES**

There are considered the features of the behavior of the magnetic fields of defects of various classes, there are identified the distinctive attributes of these defects, and approaches are proposed for determining the types of defects and evaluating the orientation.

11:30 *Alexey STASHKOV*
N.O7 **MAGNETIC CONTROL OF RESIDUAL STRESSES IN LOW CARBON STEELS**

The report presents the results of the development of magnetic methods and equipment that allow non-destructive testing of residual mechanical stresses. Control is possible without prior calibration.

11:45 **Cofee break**

12:30 **Closing ceremony**

POSTER SESSIONS

MONDAY, 09.09.2019

Monday, 09.09.2019

Section A. Spintronics and magnetic nanostructures

Poster area I.A

Chairpersons: Vladimir VAS'KOVSKIY, Andrey SVALOV

A.P1 Yuliya PEREVOZCHIKOVA

STRONG CHANGES IN ELECTRONIC TRANSPORT AND MAGNETIC PROPERTIES OF Co_2YSi HEUSLER ALLOYS AT Y-COMPONENT VARIATION

The magnetic and electronic transport properties of polycrystalline HMF compounds Co_2YSi (Y = Ti, V, Cr, Mn, Fe, Co, Ni) were investigated at T = 4.2–300 K and in fields up to 100 kOe. Significant changes in magnetic and electron transport properties are shown to be observed with a change in the number of valence electrons z within $26 \leq z \leq 32$ when going from Co_2TiSi to Co_2NiSi.

A.P2 Vladimir PRUDNIKOV

NONEQUILIBRIUM PHENOMENA IN MAGNETIC MULTILAYER NANOSTRUCTURES AND AGING IN MAGNETORESISTANCE

A Monte Carlo simulation of the non-equilibrium behavior of multilayer magnetic nanostructure consisting of alternating magnetic and nonmagnetic nanolayers is carried out. Analysis of calculated two-time autocorrelation function for structure relaxing from initial states reveals aging characterized by a slowing down with increase of the waiting time. It was revealed influence of non-equilibrium behavior on the magnetoresistance with demonstration of nontrivial aging effects.

A.P3 Niazbeck USEINOV

SPIN-DEPENDENT ELECTRON TRANSPORT IN NANOCONTACT WITH NON-COLLINEARLY MAGNETIZED ELECTRODES

The studies of the magnetoelastic effect for the production memory cells, spin-valves and logic elements of micro and nanoelectronics with the minimal energy consumption resulted in the appearance of a new research field, "straintronics". The theory of electron transport in magnetic tunnel nanocontacts was improved in order to calculate the dependences of spin-polarized current and tunnel magnetoresistance in layered structure consist from the particles with configurational anisotropy.

A.P4 Alyona SEMIANNIKOVA

ELECTRICAL, MAGNETIC AND GALVANOMAGNETIC PROPERTIES OF Mn-BASED HEUSLER ALLOYS

The aim of the work is to follow the changes in the electrical, magnetic and galvanomagnetic properties of the Mn_2MeAl Heusler alloys at varying Me-components (Me = Ti, V, Cr, Mn, Fe, Co, Ni), which are promising materials for spintronics. The anomalies in the electronic and magnetic properties of Mn_2MeAl Heusler alloys were observed. These anomalies can be a manifestation of the electronic energy spectrum peculiarities with occurrence of the HMF and/or SGS states.

A.P5 Maksim CHINENKOV

INFLUENCE OF THE MAGNETORESISTIVE ELEMENTS TOPOLOGY ON THE MAGNETIC MEMS FUNCTIONAL CHARACTERISTICS

This work demonstrated the possibility of significantly increasing the sensitivity of magnetic MEMS by using shape-coupled structures. The results of micromagnetic modeling confirmed that there was an about 70% increase in the sensitivity of shape-coupled microsystems compared to classical magnetoresistors.

A.P6 Lev FOMIN

SPIN INJECTION AND SPIN FILTERING IN SHARVIN BALLISTIC MICROCONTACTS FOR FERROMAGNETIC METALS

We solve the problem of the spin-polarized current through a Scharvin contact which is a circular aperture in an infinitely thin impenetrable dielectric barrier between two ferromagnetic leads. The aperture region is a Bloch domain wall where the magnetization vector rotates smoothly by 180° in the same plane. The scattering problem is solved using the oblate spheroidal coordinates in the exact manner.

A.P7 Gleb DEMIN

THERMOELECTRIC VOLTAGE RECTIFICATION IN A SPIN-TORQUE DIODE AND ITS PROSPECTS FOR MICROWAVE APPLICATIONS

At present, there is a growing interest in the field of spin caloritronics, which demonstrates the advantages of using thermoelectric effects when considering spin-transport phenomena. In this work, we estimated the bolometric properties of a spin-torque diode based on the magnetic tunnel junction under its microwave heating. The thermoelectric voltage in a spin-torque diode rectification plays an important role in the development of new types of microwave energy harvesters.

A.P8 Lidia GERASIMOVA

SPIN-DEPENDENT ELECTRON TRANSPORT IN NANOCONTACTS TAKING INTO ACCOUNT CHEMICAL POTENTIAL GRADIENTS

A computer program for modeling a tunnel magnetoresistance (TMR) in magnetic nanocontacts (NC) ferromagnetic/insulator/ferromagnetic (FM^L/I/FM^R, where FM^L are left and FM^R right ferromagnetic metals) with taking account gradients of chemical potentials was created. The NC is simulated by a nanosized circular insulating disk of the radius made in a membrane, which divides the space on two half-spaces, occupied by single-domain ferromagnetic metals.

A.P9 Svetlana GUDINA

ON THE EXPERIMENTAL DETERMINATION OF THE RASHBA SPIN SPLITTING IN MERCURY TELLURIDE QUANTUM WELLS

Magnetoresistance oscillation analysis in a series of HgCdTe/CdHgTe samples with a QW width of 8–15 nm, symmetrically and asymmetrically doped in the barier revealed the great values of Rashba spin splitting due to the combination of the strong asymmetry of the HgCdTe quantum well and the high electron concentration.

A.P10 Yuri SHVACHKO

SWITCHABLE SPIN-DEPENDENT TRANSPORT IN HYBRID MOLECULAR MULTILAYERS ALTERNATED WITH IRON BASED SPIN-CROSSOVER COMPLEXES

We report a phenomenon of spin-dependent electron transport in quasi-two-dimensional multilayers of organic molecules in a fractional reduction state, alternated with iron spin-crossover complexes.

A.P11 Alexandra DOMOZHIROVA

ELECTRONIC PROPERTIES OF WTe_2 AND $MoTe_2$ SINGLE CRYSTALS

The purpose of this work is to obtain new information on the electronic structure of $MoTe_2$ and WTe_2 single crystals by studying the electrical resistivity, optical properties and theoretical calculations. The temperature dependence of the electrical resistivity $\rho(T)$ of WTe_2 has a metallic type, and $\rho(T)$ of $MoTe_2$ has a semiconductor type. Optical studies showed that WTe_2 and $MoTe_2$ has no features typical of metals. Theoretical calculations indicate a more metallic state in WTe_2 than in $MoTe_2$.

A.P12 Andrey LUGOVYKH

MAGNETIC ORDERING IN GaAs-BASED SEMICONDUCTOR HETEROSTRUCTURES WITH THE MANGANESE DELTA-LAYER

A.P13 Ivan YASYULEVICH

SPIN CURRENT POLARIZATION AND ELECTRICAL CONDUCTIVITY IN METAL HELIMAGNETS

The Boltzmann equation is solved for the quantum distribution function in metallic helimagnets. The equation for the spin current has a non-trivial form and takes into account the precession of the spin current around the magnetic field. Nonlinear conduction effects in metallic helimagnets are found. The analysis of additional conductivity indicates a real possibility of observing this quantity.

A.P14 Nataly BANNIKOVA

MICROSTRUCTURE AND MAGNETORESISTANCE OF $Co_{90}Fe_{10}$/Cu AND $Co_{65}Fe_{26}Ni_9$/Cu MULTILAYERS

$Co_{90}Fe_{10}$/Cu and $Co_{65}Fe_{26}Ni_9$/Cu multilayers having Ta/$Ni_{48}Fe_{12}Cr_{40}$ as a buffer layer have been produced by dc magnetron sputtering. The crystal structure, the magnetoresistance, and the magnetization of the multilayers were studied. A correlation between the features of the microstructure and the magnitude of the magnetoresistance has been found.

A.P15 Nicholas VIGLIN

SPIN-DEPENDENT INJECTION PHENOMENA IN FERROMAGNET/SEMICONDUCTOR NANOSTRUCTURES

A.P16 Ilya BONDAREV

STUDY OF LATERAL PHOTOVOLTAIC EFFECT IN Mn/SiO_2/n-Si HYBRID STRUCTURE

Lateral photovoltaic effect (LPE) in the Mn/SiO_2/n-Si hybrid structure was studied. Temperature dependences show perculiar peaks which are presumably related to the surface states localized at the insulator/semiconductor interface. Magnetic field strongly affects LPE in low temperature region.

A.P17 Larisa NAUMOVA

MAGNETORESISTIVE PROPERTIES OF EXCHANGE BIASED SPIN VALVE CAUSED BY HELICAL MAGNETIC ORDERING IN DYSPROSIUM LAYER

Spin valves with dysprosium nanolayer were prepared by magnetron sputtering. The variation of magnetoresistive properties caused by magnetic behavior of dysprosium were investigated. It was shown that transitions to helical magnetic and to ferromagnetic ordering occur in dysprosium nanolayer. The temperatures of the magnetic phase transitions were estimated.

A.P18 Roman ZAVORNITSYN

SPIN VALVE BASED SENSOR ELEMENTS FOR FULL WHEATSTONE BRIDGE

Present work offer a method for creating opposite pinning directions in micro-objects based on a spin valve with a synthetic antiferromagnet by one thermomagnetic treatment. The method is based on the thermomagnetic treatment in spin-flop state of synthetic antiferromagnet.

A.P19 Yuri NIKULIN

SPIN WAVES DRAG ON ELECTRONS IN YIG/n-InSb MICROSTRUCTURE

We have studied effects of the magnetostatic surface waves (MSSW) propagation and detection in YIG/n-InSb microstructure with the semiconductor element ($d \approx 0.5$ μm, width $b \approx 100$ μm, length $L \approx 200$ μm) and with the antennas for the MSSW excitation integrated on the epitaxial YIG surface. For the MSSW power P less than threshold of the parametric instability processes, $U(f)$ was proportional to P: $U(f) = G(f)P(f)$. The sensitivity for the studied structure in the linear regime was $G \approx 0.02$ V/W.

A.P20 Sergey NOVOKSHONOV

QUANTIZATION OF THE ANOMALOUS HALL CONDUCTANCE IN A DISORDERED MAGNETIC CHERN INSULATOR

An explicit expression for the intrinsic anomalous Hall conductance, σ_H, of Chern insulator in the self-consistent Born approximation is obtained. It is shown that σ_H of disordered topological insulator takes a quantized value $\pm e^2/4\pi\hbar$ when the Fermi level lies in the gap of the energy spectrum. This gap closes as disorder increases that leads to the breakdown of the anomalous Hall conductance quantization.

A.P21 Maksim STEBLIY

CURRENT INDUCED SWITCHING OF MAGNETIZATION IN THE Pt/Co/NiO STRUCTURE

An experimental study of current-induced magnetization reversal in the Pt/Co/NiO system was performed. The dependence of the SOT effective fields on the Co and NiO layers thickness obtained. It was found that depend on the Co layer thickness the current induced reversal can occurs through the nucleation of domains or through the domain wall motion.

A.P22 Nikolay CHECHENIN

GMR EFFECT IN NONHOMOGENEOUS MAGNETIC FIELD

GMR or spin-valve based magnetic field (SVMF) sensors have a wide range of practical implementations. One of them is the use as a positioning device in different kind of actuators. Here we report on modeling of magnetoresistivity response of SV structure in a various geometry of SV positioning with respect to a magnetic reference label.

A.P23 Dmitry SMOLYAKOV

HIGH MAGNETIC FIELD MAGNETOIMPEDANCE EFFECT IN A MIS STRUCTURE

In this paper we presented the results of measurements of the transport properties of metal/insulator/semiconductor hybrid structure with the Schottky barrier. Magnetoimpedance peak was detected in a magnetic field on the temperature dependence of the real part of the impedance. These feature depend on the orientation of the magnetic field, which is determined by the influence of the Lorentz force.

A.P24 Sayan CHAUDHURI

OCCURRENCE OF HALF-METALLICITY BY Sb-SUBSTITUTION IN NON-MAGNETIC Fe_2TiSn

Aim of this research work is to substitute Sb in Sn site of non-magnetic semimetal Fe_2TiSn, to create half metallic system having small magnetic moment, suitable for practical applications. Theoretical calculation of Density of States using DFT shows, after 25% substitution of Sb, the system becomes half metallic. The synthesized $Fe_2TiSn_{1-x}Sb_x$ compositions were analyzed using various transport, magnetotransport and magnetometry studies in order to explore their half metallic properties.

A.P25 Alexander MAKHNEV

EFFECT OF NONSTIOCHIOMETRY ON ELECTRONIC AND OPTICAL PROPERTIES OF $Mn_{1.75}Co_{1.25}Al$

The aim of the present study is to investigate transformations of electronic structure of spin gapless $Mn_{1.75}Co_{1.25}Al$, which occur when the crystal structure type changes, and to study peculiarities of optical properties of real sample $Mn_{1.8}Co_{1.2}Al$.

A.P26 Anton KHARKOV

EFFECT OF MAGNETIC FIELD ON ELECTRIC RESISTANCE AND IMPEDANCE OF SOLID SOLUTIONS $Yb_xMn_{1-x}S$

At present, semiconductors detecting the effect of magnetoresistance and magnetoimpedance for spintronic devices and sensors are being actively studied. As promising materials, we investigate magnetic semiconductors based on manganese sulphides replaced by rare-earth elements with variable valence. The influence of the magnetic field on the transport characteristics is due to both the charge and spin degrees of freedom of the electron.

A.P27 Anna SAMOSHILOVA

INFLUENCE OF DIFFUSE INTERFACES ON THE MAGNETORESISTANCE IN TRILAYER MAGNETIC STRUCTURES

The Monte Carlo study of influence of diffuse interfaces on the magnetoresistance in Co/Cu(100)/Co magnetic structure is carried out. The calculations of temperature dependence of the magnetoresistance were realized for structures for cases with sharp and diffuse interfaces. Comparison of results shows that diffuse interfaces lead to relative decrease of the magnetoresistance in temperature range near room temperature, but to more high values of the magnetoresistance in low temperature range.

A.P28 Tatyana TARASENKO

THE PECULIARITIES OF "METAL-INSULATOR" PHASE TRANSINION IN $GdBaCo_2O_{5+\delta}$: SPIN BLOCKADE

Infraslow thermal relaxation of conductivity with characteristic times 10^4 s have been detected at phase transition metal-insulator (M–I) in polycrystalline $GdBaCo_2O_{5.53}$. The shape of the hysteresis loop depends on the rate of temperature change. The loop expansion asymmetry is related with the blocking of M phase nuclei. The spin blockade mechanism, which describes the transition from hopping to the band conductivity, is used to explain of the 1^{st} order M-I transition peculiarities.

A.P29 Polina PENKINA

OPTICAL INDUCING OF SPIN CURRENTS IN STRUCTURES WITH PHOTONIC CRYSTALS

We have demonstrated the optical excitation of spin currents in structures containing a magnetic layer, a layer of the material with giant spin-orbit coupling and a photonic crystal due to the Spin Seebeck effect. Also we have shown the increasing of optically induced spin currents by surface waves.

A.P30 Yurii KUZNETSOV

ANOMALOUS NERNST-ETTINGSHAUSEN EFFECT IN InFeSb AND GaFeSb DILUTED MAGNETIC SEMICONDUCTORS

In this work, we study the magnetic field dependences of the Hall and Nernst-Ettingshausen voltages on thin InFeSb and GaFeSb films formed on GaAs by pulsed laser deposition. The presence of nonlinearity in both types of magnetic field dependences is shown, which is associated with the presence of spin-dependent scattering of free charge carriers in the structures under study.

A.P31 Amir GUMAROV

FERROMAGNETISM OF Pd THIN FILMS INDUCED BY Fe-ION IMPLANTATION

Magnetism of thin epitaxial palladium films heavily implanted with Fe^+ ions was studied utilizing magnetometry and FerroMagnetic Resonance techniques. FMR in the highest fluence sample ($3x10^{16}$ ion/cm^2) has shown up to 3 signals appearing one-by-one with lowering the temperature. We propose model and verify it by synthesis of $Pd_{1-x}Fe_x$ alloy films that the metastable Pd-Fe solid solution decomposes on sub-layers, the number and magnetic properties of which depend on the implantation fluence.

A.P32 Mikhail PASYNKOV

SYNTHESIS AND STUDY OF A THIN FILM OF PdFe ALLOY WITH AN ORDERED $L1_0$ STRUCTURE

We present results of the synthesis and study of a thin film of $Pd_{53}Fe_{47}$ alloy with the ordered $L1_0$ structure. Perpendicular magnetocrystalline anisotropy was confirmed by vibrating sample magnetometry and Mössbauer spectroscopy measurements. The $L1_0$ ordering was established by XRD study of the sample as being of tetragonal symmetry. Based on these results, it is concluded that the obtained structure can be used as a medium for ultrahigh density magnetic recordings.

A.P33 Nikolay KOSYREV

EXCHANGE COUPLING IN Dy_xCo_{1-x}/Bi/NiFe FERRIMAGNET SPIN VALVE

The magneto-optical Kerr effect to study the temperature dependence of the magnetization of three-layer Dy_xCo_{1-x}/Bi/NiFe systems was used. The studies were carried out on a NanoMOKE2 setup with Oxford Instruments optical cryostat in the temperature range T = 4.2–300 K at various angular orientation of the sample. It is shown that the thickness of the bismuth interlayer affects the exchange interaction between the NiFe and DyCo layers, which is manifested in a change in the magnetization compensation temperature. With an increase in the thickness of the Bi interlayer, the magnetization compensation temperature gradually decreases from 230 K to about 160 K.

A.P34 Ekaterina NIKOVA

NOVEL METHOD OF PHASE DETERMINATION IN NEUTRON REFLECTOMETRY USING REFERENCE LAYER

We have developed a novel method, which is based on using gadolinium of known thickness as a reference layer. The gadolinium reference layer allows us to reconstruct the complex reflection coefficient from magnetic nanostructures. This method gives possibility to use direct model-independent methods (such as Gelfand-Levitan-Marchenko equation) in order to obtain the scattering potential.

A.P35 Vera TSVELIKHOVSKAYA

TECHNOLOGY FEATURES OF CREATING InSb-BASED SPIN-VALVE

A technological process of creating a spin device with ferromagnetic CoFe contacts and an MgO tunneling barrier on an n-InSb semiconductor by contact photolithography was developed. Semiconductor surface preparation and photoresist exposure parameters were optimized by measuring the Hanle effect. It is concluded that the optimization of photolithographic operations contributes to an increase in the magnitude of the electron polarization coefficient.

Section L. Magnetic soft matter

Poster area I.B

Chairpersons: Dirk ROMEIS, Yuriy RAIKHER

L.P1 Anton MUSIKHIN

ELASTIC STRESS IN FERROGELS WITH CHAIN AGGREGATES

The paper deals with the theoretical study of the influence of macroscopic shear and longitudinal deformations on stress in magnetic polymer composites in which magnetic particles form linear chains. The results show that the chains break at a certain value of the deformation. In this case, the full stress experiences a jump down. This effect is observed for both types of the deformation.

L.P2 Dmitry CHIRIKOV

COMPUTER SIMULATIONS OF ANISOTROPIC STRUCTURES IN MAGNETORHEOLOGICAL ELASTOMERS

In this work the computer simulation method, developed for modeling of the anisotropic heterogeneous structures, is presented. This method is based on numerical solution of the system of differential equations of all particles motion. The advantage of the computer experiment is the ability to take into account the magnetic forces of all particles, without any assumptions about structures. To perform the computer simulations, the software was written for Linux operating system.

L.P3 Vladimir ZVEREV

CHARACTERISTIC RELAXATION TIMES FOR THE MULTICORE MAGNETIC ANISOTROPIC NANOPARTICLES

The investigation is mainly focused on the theoretical description of behavior multicore magnetic particles. Multicore particles contain an ensemble of magnetic nanocrystals with different packing densities and their spatial structure is fixed by a polymer shell. The modified mean-field approach of first-order is used to take into account the dipole-dipole interaction. The correction term for the well-known expressions the relaxation time is obtained.

L.P4 Ali ABU-BAKR

CLUSTER LIKE-AGGREGATES OF NANOPARTICLES ON MAGNETIC

The present work deals with theoretical study of the magnetic hyperthermia in a system of ferromagnetic nanoparticles, united into heterogeneous aggregates where we consider two systems of single-domain ferromagnetic particles. In the first one, they are randomly distributed in host medium. In the second one the particle are united in heterogeneous aggregates The results show that the particles aggregation decreases the hyperthermia effect.

L.P5 Juan de Dios GARCIA LOPEZ-DURAN

VISCOELASTICITY OF MAGNETIC GELS CONSISTING OF IRON PARTICLE CLUSTERS EMBEDDED IN POLYMER MATRICES

This work deals with ferrogels consisting of networks of alginate polymer chains and embedded silica-covered iron microparticles. The viscoelastic moduli of these ferrogels were obtained both in the absence and in the presence of external magnetic fields. Interestingly, the enhancement of the storage modulus upon a maximum magnetic field of 282 kA/m reached values as high as approximately 2000%.

L.P6 Michael DEREVYANKO

MAGNETOIMPEDANCE RESPONSES TO THERMAL AND DEFORMATION EFFECTS IN COBALT-BASED AMORPHOUS ALLOYS: MAGNETOSTRICTION ROLE

Magnetostriction influence on the magnetoimpedance response to a thermal and deformative effect of amorphous cobalt-based alloys was investigated.

L.P7 Petr MELENEV

MODEL OF THE FERROGEL SAMPLES WITH SPONTENOUSLY FORMED INTERNAL STRUCTURE

We consider mechanical response of small sample made of ferrogel subjected to the external magnetic field using a model, based on the coarse-grained molecular dynamics approach. The specific of the present work is that the internal structure of composite is formed directly in simulation. The influence of parameters of material elements on the magneto-mechanical response of the sample is examined.

L.P8 Alla DOBROSERDOVA

MAGNETIC PROPERTIES OF MAGNETOACTIVE ELASTOMERS WITH THE SHAPE ANISOTROPY OF MAGNETIC PARTICLES

In this research we study magnetic properties of magnetoactive elastomers using the Molecular Dynamics Simulations. We consider magnetic particles with the shape anisotropy. In a results, we model the magnetoactive elastomers filled with the magnetic particles with a shape close to a flake. For such systems we can measure magnetisation curves, radial distribution functions, First Order Reversal Curves (FORCs) distribution, *etc*.

L.P9 Danil ISAEV

SIMULATION OF ELECTRIC AND MAGNETIC PROPERTIES OF MAGNETIC ELASTOMERS BASED ON ANISOTROPIC IRON PARTICLES

We present the results of computer simulation of magnetic and electric properties of magnetorheological elastomers (MRE). In prior work simple model of the effect was presented. In this work we present enhanced model with particles magnetic anisotropy and mechanical rotation taken into account.

L.P10 Iuliia ALEKHINA

LAYERED MAGNETORHEOLOGICAL ELASTOMER AND PIEZOELECTRIC POLYMER STRUCTURE WITH MAGNETOELECTRIC EFFECT

Layered composite multiferroic based on magnetorheological elastomer with iron microparticles and PVDF piezoelectric film was investigated. Large values of magnetodeformation in magnetorheological elastomers and flexibility of piezoelectric layer allows to obtain the material with enhanced magnetoelectric transformation. The maximum values of experimental magnetoelectric effect in the proposed structure can reach several tens mV·cm/Oe.

L.P11 Mikhail AVDEEV

EFFECTS OF EXTERNAL MAGNETIC AND ELECTRIC FIELDS ON STRUCTURAL ORGANIZATION OF FERROFLUIDS IN BULK AND AT INTERFACE

The behavior of magnetic nanoparticles in ferrofluids in bulk and interface in the presence of external magnetic and electric fields is compared basing on the data of small-angle neutron scattering and neutron reflectometry.

L.P12 Igor SUBBOTIN

MATHEMATICAL MODELING OF AN INVERSE FERROFLUID EMULSIONS

L.P13 Anna AKISHEVA

INFLUENCE OF THE EXTERNAL MAGNETIC FIELD ON THE SYSTEM OF MAGNETIC ELLIPSOIDAL NANOPARTICLES

We present a complex investigation of the system of magnetic ellipsoidal nanoparticles based on the combination of theory study and computer simulations. Our work is made to analyze the influence of external magnetic field on the self-assembly in the systems of magnetic ellipsoids and compare results for cases with various orientation of magnetic moments.

L.P14 Ekaterina MIKHNEVICH

INFLUENCE OF MAGNETIC FIELD ON COMPRESSION MODULUS IN FERROGELS WITH EMBEDDED NICKEL NANOPARTICLES

Ferrogels are of great interest for bioengineering as a material for sensors, detectors, actuators. Ferrogel is a networking polymeric matrix that is swollen in a solvent into which magnetic particles are embedded. Due to its network structure, a ferrogel combines the elasticity of a polymeric material with the ability to respond to magnetic field. One of the main parameters characterizing the mechanical properties of ferrogel is the modulus of elasticity (Young modulus).

L.P15 Ekaterina NOVAK

RHEOLOGICAL PROPERTIES OF MAGNETIC NANOSCALE FILAMENTS

In this contribution, using Molecular Dynamics simulations, we focused on the behavior of a single magnetic filament placed in the microchannel (being free or fixed at one end to the channel wall). We allowed for two possibilities: particles in the filament were either ferromagnetic or superparamagnetic. We thoroughly investigated filament behavior in the shear flow, varying a wide range of system parameters.

L.P16 Elena PYANZINA

INITIAL SUSCEPTIBILITY OF MAGNETIC FILAMENTS SYSTEMS

In this work we investigate initial susceptibility of magnetic filaments (flexible polymer-like chains of magnetic nanoparticles) of different topology under the influence of various internal parameters: dipole-dipole interaction, particle sizes, conformations and lengths of chains. We investigate simple open chains, closed rings and X and Y-junctions and use Langevin dynamics simulations and analytic theory.

L.P17 Mikhail VAGANOV

FORC DIAGRAMS OF UNDERMAGNETIZED MAGNETORHEOLOGICAL ELASTOMERS

One of the perspective fillers for soft magnetorheological elastomers are rapidly solidified powders of NdFeB particles consisting of single domain grains. The anisotropy field of $Nd_2Fe_{14}B$ compound is estimated at about 7.3 T, that is much higher than what a typical magnetometer can provide, so the samples are undermagnetized during experiments. We apply the method of first order reversal curve (FORC) diagrams for investigating physical properties of such materials.

L.P18 Marina GUPALO

THE IMPACT OF EXTERNAL MAGNETIC FIELDS ON STRUCTURAL PROPERTIES OF MAGNETIC POLYMERS MIXTURES

We investigate interactions between magnetic filaments of different shapes and the impact of external magnetic fields on their self-assembly. Four types of magnetic polymer were considered: chains, rings, X- and Y-structures. We obtained information about systems by analyzing radial distribution functions, structure factors, initial susceptibilities and connections between filaments. Finally, we compared our results for magnetic filaments with similar systems of pure ferrofluids.

L.P19 Tatyana BELYAEVA

SELF-ASSEMBLY OF POLYDISPERSE SUPRAMOLECULAR MAGNETIC POLYMERS

This article is devoted to the study of the influence of polydispersity on the self-assembly of supramolecular magnetic polymers. Using simulation of the Langevin dynamics, we study various structural parameters of one magnetic polymer of various configurations: chains, closed rings, X-shaped and Y-shaped. Changes in the equilibrium properties of the filament were also analyzed by comparing the values of gyration radius, magnetic moment, form factor, and anisotropy of each type of polymer.

L.P20 Stanislav KUNIKIN

REMANENCE MAGNETIZATION OF FERROFLUID AT LOW TEMPERATURES

Investigation of remanence magnetization of magnetite ferrofluid presented. Change of interparticle interaction mechanism and maxima on Henkel plot at the temperature of 20 K observed. interpretation of these result based on the assumption of the presence of two fractions of particles with different magnetic structure.

L.P21 Grigory MELNIKOV

STRUCTURE, MAGNETIC AND MAGNETOIMPEDANCE PROPERTIES OF $Fe_{19}Ni_{81}$/Ti-BASED MULTILAYERS

In this work we investigate microstructure, magnetic and GMI properties of $Ti/[Py/Ti]_{10}/[Cu/Ti]_5/[Py/Ti]_y$ (y = 7–10) magnetoimpedance multilayers with different degree of asymmetry, where Py is $Fe_{19}Ni_{81}$.

L.P22 Dmitriy MAKAROV

EFFECT OF FINITE ANCHORING ON FERROCHOLESTERIC-FERRONEMATIC TRANSITIONS INDUCED BY A MAGNETIC FIELD AND SHEAR FLOW

We study the combined action of a magnetic field and shear flow on the helical structure of a ferrocholesteric liquid crystal. The finite and planar anchoring between the liquid-crystalline matrix and magnetic particles is assumed. We obtain diagrams of ferrocholesteric-ferronematic transition for different values of anchoring energy, field influence parameter, strength and orientation angle of the magnetic field, flow gradient and reactive parameter.

L.P23 Ahmad Safwan ABO SALEH

POLIACRYLIC ACID SOLUTIONS IN THE MAGNETIC FIELD

Currently, distinct attention is given to the study of the properties of polyelectrolytes. In this regard, the purpose of the work was to study the rheological properties of solutions of PA in water with different values of the pH in a magnetic field and in its absence. Found a significant increase in viscosity for solutions PA in a magnetic field. Based on the temperature dependences of the initial viscosity, the enthalpies of the viscous flow process were calculated at different pH values.

L.P24 Danil PETROV

MAGNETIC PARTICLES STRATIFICATION CAUSED BY GRAVITATIONAL AND MAGNETIC FIELDS IN SOFT FERRONEMATICS

In the framework of continuum theory, we have studied the magnetic particles stratification caused by gravitational and magnetic fields in ferronematic, *i.e.* a highly dispersed suspension of ferroparticles in a nematic liquid crystal. Orientational and concentration spatial distributions are constructed for different values of the magnetic field.

L.P25 Fernando GONZALEZ-CABALLERO

RHEOLOGICAL PROPERTIES OF FERROGELS BASED ON NA-ALGINATE AND BENTONITE/Fe_3O_4 COMPOSITES

Ferrogels are among the new classes of magneto-responsive composite materials that change their characteristics under the influence of magnetic fields. Magnetic nanoparticles were successfully synthesized by co-precipitation method using natural bentonite as condensation nuclei. The resulting composite particles were imbedded into alginate polymer networks. We found that the mechanical properties of the resulting hydrogels were reversible tuned by non-contact magnetic forces.

L.P26 Constantine YERIN

INVESTIGATION OF MAGNETIC EMULSIONS IN MAGNETIC FIELD BY ROTATING TEST-TUBE METHOD

The effect of diffraction light scattering in water-based magnetic emulsions using rotating test-tube method is investigated. A nonlinear form of the dependence of the rotation angle of the diffraction scattering pattern on the rotation speed of the test-tube is established. It is shown that the experimental dependencies can be interpreted taking into account the destruction of chain aggregates of microdroplets during rotation of the test-tube.

L.P27 Victoriya VIVCHAR

FIELD DEPENDENCE OF MAGNETOOPTIC EFFECT IN MAGNETIC COLLOID WITH SUPERPARAMAGNETIC PARTICLES

The dependences of magnetic birefringence on the magnetic field strength for colloids with superparamagnetic and nonsuperparamagnetic magnetite nanoparticles are investigated. It is shown that for both samples the field dependences in a weak field are parabolic. Found a significant difference between the experimental data on the magnitude of birefringence from the theoretical model, taking into account the superparamagnetism of nanoparticles.

L.P28 Alexander NOVIKOV

DIPOLE AND QUADRUPOLE MAGNETIC MECHANISMS OF UNTWISTING OF COMPENSATED FERROCHOLESTERIC LIQUID CRYSTAL

We study the untwisting of the FC helical structure induced by action of a magnetic field. The case of a compensated suspension is considered. The conditions for the coupling of magnetic nanoparticles with the CLC matrix will be soft.

L.P29 Roman KREKHNO

MAGNETIC HYPERTHERMIA OF POLYMER COMPOUNDS WITH MAGNETIC PARTICLES IN HIGH FREQUENCY ALTERNATING FIELD

The Calvet microcalorimetry method was used to study the thermal effect for hyperthermia of magnetically filled polymer composites in homogeneous alternating magnetic fields with an intensity of no more than 1700 A/m and frequency in range from 50 to 400 kHz. A nonlinear monotonically increasing dependence of the hyperthermia power with frequency, field intensity and particle concentration was discovered.

L.P30 Anastasia STOROZHENKO

THE INFLUENCE OF MAGNETIC NANOPARTICLES WITH BROWNIAN AND NEEL RELAXATION ON ROTATIONAL EFFECT

The dynamics of ferrofluids has a long researching history. Nevertheless, there are some blind spots even in the simplest case, when a spherical capsule filled with ferrofluid is influenced by a rotating magnetic field (so called rotational effect). Here, a torque value depends on the parameters of magnetic field as well as on the structure and properties of a ferrofluid. Therefore, the main goal of this paper is to try to understand their relationships.

L.P31 Dmitry GLADKIKH

RELAXATION OF THE MAGNETIZATION OF FERROFLUIDS IN POROUS MEDIA

The frequency and temperature dependences of the magnetic susceptibility of magnetic colloids placed in porous media have been found to be different from the similar dependences for bulk samples. The observed peculiarities can be explained by the influence of surface phenomena on the processes of relaxation of the magnetic moment of colloidal particles.

L.P32 Pedro A. SANCHEZ

COMPUTER MODELING OF SURFACE CONTROL IN MAGNETOACTIVE ELASTOMERIC FILMS: EFFECTS OF FILLER ANISOMETRY

We present results on the theoretical computer simulation modeling of magnetic elastomers (ME) disposed as thin coatings on a rigid flat substrate. It is possible to change dynamically the surface roughness and, with it, the wettability and adhesion properties of such coating by applying external magnetic fields. We focus on the effects of shape anisotropies of the embedded magnetic particles on the response of the material, comparing with the simpler case of ideal spherical particles.

L.P33 Martin KAISER

DIPOLAR-ACTIVE NANOCUBES

Microscopic active particle have gained a lot of attention due to their relevance in such important fields as biology, biomedicine, nanoscience and nanotechnology. The term ”active” describes the ability of certain particles or units, to convert energy from their environment into motion, hence, kinetic energy. In this study, we use active matter to create a new type of nanomotor, which is oriented by an applied magnetic field and propelled by an active particle.

L.P34 Artem ELISEEV

DYNAMICS AND SELF-ORGANIZATION OF COLLOIDAL HEXAFERRITE NANOPLATES

Current study is devoted to organization processes in ferrofluids based on particles with fixed magnetic moment. Colloidal solutions containing single hexaferrite nanoplates, stabilized by electrostatic repulsion, were synthesized by borate glass dissolution technique. Possibility of macroscopic control (for example by magnetic field) over microscopic parameters like particles orientation or interparticle distance was shown by SAXS experiment.

Section J. Soft and hard magnetic materials

Poster area III.A

Chairpersons: Oksana GOLOVNIA, Nikolai BARANOV

J.P1 Ekaterina VOLEGOVA

EFFECT OF INTERGRAIN EXCHANGE INTERACTION ON MAGNETIC VISCOSITY OF NANOCRYSTALLINE ISOTROPIC Nd–Fe–B MAGNETS

Magnetic viscosity of samples with different intergrain exchange interaction was studied. Dependences fluctuation field *vs.* external magnetic field in logarithmic coordinates are linear with the slope lower than original or modified Barbier plot either for strong or for weak intergrain interaction. The deviation from modified Barbier coefficient may be due to strong interdomain or intergrain interactions of magnetostatic nature.

J.P2 Ekaterina MELNIKOVA

CHARACTERIZATION OF $Nd_2Fe_{14}B$-BASED NANOCRYSTALLINE ALLOYS BY FIRST ORDER REVERSAL CURVE TECHNIQUE

This work is aimed at FORC-diagram study of $Nd_{11.8}(Fe_{1-x}Co_x)_{82.3}B_{5.9}$ with x = 0.0, 0.2, 0.5 and $Nd_9Fe_{85}B_6$ nanocrystalline alloys. All alloys were obtained by melt spinning and heat treatment after that. FORC-diagrams were measured by vibrating sample magnetometer at room temperature. Transformations of the diagrams with composition variation were established and discussed. Experimental results were interpreted using Stoner-Wohlfarth-based computer model.

J.P3 Anton BOLYACHKIN

POWER-LAW BEHAVIOR OF COERCIVITY IN NANOCRYSTALLINE ALLOYS WITH GRAIN-SIZE DISTRIBUTION

Coercivity of nanocrystalline magnetic alloys depends on the grain size D according to a power law $H_c \propto D^n$. The law $H_c \propto D^6$ is derived based on the random magnetic anisotropy model and is clearly manifested in experimental studies. In this report using computer modeling it is demonstrated that a power-law behavior with the exponent n less than 6 can be due to a grain-size distribution. An increase of grain size variance results in a decrease of the exponent from 6 to the value of about 3.

J.P4 Sergiu RUTA

MAGNETIC SUSCEPTIBILITY OF HIGH-ANISOTROPY NANOCRYSTALLINE ALLOYS IN THE REMANENT STATE

Reversible magnetic susceptibility in the remanent state of the nanocrystalline alloy with randomly oriented easy magnetisation axes was studied by means of the mean-field approach and simulations using the kinetic Monte Carlo model. Based on obtained results an experimental method for estimation of both intergrain exchange interaction constant and effective magnetic anisotropy one was proposed and applied to rapidly quenched $Nd_2(Fe_{0.8}Co_{0.2})_{14}B$ nanocrystalline alloy.

J.P5 Anna SOLOVYOVA

DIPOLAR INTERPARTICLE CORRELATIONS IN FERROMAGNETIC CRYSTAL

In this work ferromagnetic crystal was studied by theory and computer simulation. It turned out that the magnetic properties of a crystal with a large lattice period are close to the characteristics of a low-concentration ferrofluid and it can be described by ordinary well-known second-order modified mean-field theory. For more dense model crystal, there was developed new theoretical approach, which takes into account dipole-dipole interparticle interactions for fixed ferroparticle lattice.

J.P6 Evgeniya MIKHALITSYNA

MAGNETIC MICROSTRUCTURE OF THE FINEMET-TYPE THIN FILMS

This work is dedicated to the application of the method of correlation magnetometry for amorphous and nanocrystalline films of the Finemet-type alloys in which the state with a random distribution of anisotropy axes can be realized. The method of magnetocorrelation analysis is widely used in the study of amorphous and nanocrystalline ribbons, making it possible to estimate the main parameters of their magnetic microstructure, which define macroscopic properties of the material.

J.P7 Vladimir ZHIVULIN

MAGNETIC PROPERTIES OF HIGH-ENTROPY $BaFe_6Ti_{1.21}Co_{1.15}In_{1.17}Ga_{1.25}Cr_{1.22}O_{19}$ CERAMICS WITH MAGNETOPLUMBITE STRUCTURE

The $BaFe_6Ti_{1.21}Co_{1.15}In_{1.17}Ga_{1.25}Cr_{1.22}O_{19}$ high-entropy phase with magnetoplumbite structure was investigated. Saturation magnetization in the external magnetic field 3 T at 50 K for $BaFe_6Ti_{1.21}Co_{1.15}In_{1.17}Ga_{1.25}Cr_{1.22}O_{19}$ alloy decreases in compare to initial barium ferrite sample approximately for 70% (87.95 Am^2kg^{-1} for $BaFe_{12}O_{19}$ and 26.43 Am^2kg^{-1} for $BaFe_6Ti_{1.21}Co_{1.15}In_{1.17}Ga_{1.25}Cr_{1.22}O_{19}$). In this studied composition we observe decreasing coercivity with increasing temperature.

J.P8 Vladimir ZHIVULIN

THE SUBSTITUTED STRONTIUM FERRITES: SYNTHESIS, STRUCTURE AND PROPERTIES

In this work, a single phase ceramics of Mn-substituted strontium hexaferrite were obtained by the method of solid-phase synthesis. The chemical composition, the crystal structure and properties were studied.

J.P9 Aleksei SAMARDAK

PHASE ANALYSIS AND MAGNETIC PROPERTIES OF NdFeCoB MAGNETIC NANOPARTICLE SYNTHESIZED BY PECHINI METHOD

In this abstract, we report our experimental results on synthesizing of Nd-Fe-Co-B nanoparticles by a Pechini-type sol-gel method. $NdCl_{3.6}H_2O$, $FeCl_{3.6}H_2O$, $CoCl_{2.6}H_2O$ H_3BO_3, citric acid (CA) and ethylene glycol (EG) were used as precursor materials. First, a dry gel (resin) was prepared according to Pechini method which was converted into oxide powder by the calcination process. Then, the oxide powders were reduced in the hydrogen (H_2) atmosphere to obtain NdFeCoB magnetic alloy.

J.P10 Elena STEPANOVA

MAGNETIC AND MAGNETOIMPEDANCE PROPERTIES OF RAPIDLY QUENCHED RIBBONS OF MODIFIED ALLOYS BASED ON FINEMET

The structure, static magnetic properties and magnetoimpedance (MI) were studied for FINEMET-type materials both with classic composition ($Fe_{73.5}Si_{13.5}B_9Nd_3Cu_1$ (FM)) and for compositions with 10% of iron substitution by Co (FM-Co), Ni(FM-Ni), or Mn (FM-Mn) both in initial state and after heat treatment. A large values of MI ratio in the initial state for FM-Ni and FM-Mn alloys are quite promising as they allow usage of these materials for sensor applications.

J.P11 Andrey TELEGIN

MAGNETO-OPTICAL PROPERTIES OF EPITAXIAL STRAINED FERRITE FILMS GROWN BY MOCVD METHOD

Co- ferrites are the potential material as for perpendicular recording as creation magnetostatic wave devices. We studied for the first time the magnetooptical properties of $\sim$ 100 nm thick $CoFe_2O_4$ epitaxial films grown by metal-organic chemical vapour depositions method on a hastelloy tape and $ZrO_2(Y_2O_3)$ substrate. Utilizing the substrates with high mismatch ratio let to enhance to out-of-plane magnetization component and change the MO and microwave properties of the films.

J.P12 Andrey PROTASOV

STUDY THE PHASE TRANSFORMATIONS IN THE COURSE OF HEAT TREATMENT OF THE MELT-SPUN $Sm_{0.8}Zr_{0.2}(Fe_{0.92}Ti_{0.08})_{10}$ ALLOY

We have managed to obtain the melt-spun nanocrystalline $Sm_{0.8}Zr_{0.2}(Fe_{0.92}Ti_{0.08})_{10}$ alloy with coercivity as high as H_c = 4.7 kOe after annealing in the temperature range of T = 800 – 850 °C.
The aim of this work is to study in detail the sequence of phase transformations in the melt-spun $Sm_{0.8}Zr_{0.2}(Fe_{0.92}Ti_{0.08})_{10}$ alloy in the course of annealing using X-ray diffraction and thermomagnetic analyses, as well as Mössbauer spectroscopy.

J.P13 Maysara SALAKHITDINOVA

SUPERPARAMAGNETISM IN POTASH-ALUMINUM-BORON GLASSES WITH IRON OXIDE ADDITIVES

The condition of homogeneous Fe^{3+} distribution in the glass matrix can be considered as the superparamagnetic phase state, which in fact is caused by self-organization of $\{O = [Fe^{2+}\ Fe^{3+}] \equiv O\}^x$ molecular clusters. For more exact determining super-paramagnetism, here we have studied magnetization and microscopy of the iron domain structure in dependence on the gamma-irradiation dose and iron concentration.

J.P14 Vera LUKSHINA

MAGNETIC PROPERTIES AND STRUCTURE OF THE $Fe_{63.5}Ni_{10}Cu_1Nb_3Si_{13.5}B_9$ ALLOY NANOCRYSTALLIZED IN THE PRESENCE OF TENSILE STRESSES

For the $Fe_{63.5}Ni_{10}Cu_1Nb_3Si_{13.5}B_9$ alloy the connection of structural state with its magnetic properties and IMA type is determined. It is shown that transverse magnetic anisotropy induced in the process of SA is caused by forming of nanocrystals of α-(Fe,Ni)Si solid solution and Fe_3Si phase with negative magnetostriction.

J.P15 Dmitrii BUKREEV

MAGNETOIMPEDANCE EFFECT IN Co-BASED AMORPHOUS WIRES AFTER CIRCULAR AND AFTER AXIAL MAGNETIZATION

We studied how magnetoimpedance effect (MI) in amorphous CoFeNbSiB wire changes after preliminary magnetization by an axial and circular field. We discovered that the MI strongly depends on the direction, intensity and sequence of application of magnetic fields used to pre-magnetize the wire.

J.P16 Denis KOLODKIN

EFFECT OF SOLID SOLUTION TREATMENT AND NITROGENATION ON MAGNETIC PROPERTIES OF $Sm_{2+\alpha}Fe_{17}N_x$ POWDERS

In this work, effects of solid solution treatment and nitrogenation on the magnetic properties and structure of the $Sm_{2+\alpha}Fe_{17}N_x$ ($\alpha = 0 \div 0.6$) powders are studied. The optimization of the nitrogenation (the particle size, the temperature and duration of nitrogenation, and the gas environment) allowed us to increase the amount of interstitial nitrogen atoms, which significantly enhanced the magnetic properties of the nitrogenated powders. The ball milling of the nitrogenated powder significantly enhanced H_c.

J.P17 Anna IVANOVA

STUDY OF THE MAGNETIC MICROSTRUCTURE OF TERNARY QUASI-ORDERED ALLOYS BASED ON $Fe_{65}Al_{35}$ USING VARIATION OF TEMPERATURE AND EXTERNAL MAGNETIC FIELD

The results of Mössbauer and magnetic measurements of the binary alloy and of the ternary quasi-ordered $Fe_{65}Al_{35-x}M_x$ and $Fe_{65-y}Al_{35}M_y$ alloys (M = Ga, B, V, Mn; x, y = 3, 5, 10 at.%) at variable temperature and magnetic field are presented. An explanation of the observed behavior of the magnetic characteristics is given within the magnetic phase separation model.

J.P18 Dmitriy PETROV

CORE-SHELL IRON OXIDE – CARBON NANOPARTICLES MODIFIED WITH Ag. SYNTHESIS, MORPHOLOGY, MAGNETIC PROPERTIES

This work is devoted to the study of the morphology, magnetic and magneto-optical properties of mixed nanostructures Fe_3O_4-C-Ag and γFe_2O_3-C-Ag with different Ag concentration. Samples were synthesized by pyrolysis and consisted of iron oxide nanoparticles with mean size about 20 nm coated with carbon shell and smaller Ag nanoparticles. Magnetization curves for all samples demonstrate hysteresis. MCD spectra appeared to be very sensitive to the core magnetic phase.

J.P19 Elizaveta SCHAPOVA

MAGNETIC, ELECTRIC PROPERTIES AND HARDNESS OF 17-4 PH STAINLESS STEEL FABRICATED BY SELECTIVE LASER MELTING

The magnetic and electric properties, hardness and microhardness of 17-4 PH stainless steel sample were investigated. The sample was found to be non-isotropic. The properties of as-fabricated sample and heat-treated sample were found to be different.

J.P20 Mark STRUGATSKY

MAGNETIC FIELD INDUCED TRANSFORMATION OF LONGITUDINAL SOUND IN IRON BORATE

Experimental and theoretical studies of the field dependences of the transmission coefficient of longitudinal hypersonic waves in iron borate have been carried out. Experiments have revealed that these dependencies are of oscillating form. It is theoretically shown that observed oscillations arise as a result of transverse acoustic modes mixing to the longitudinal sound. The mixing mechanism is due to the magnetoelastic coupling and is realized through the excitation of magnetic subsystem.

J.P21 Sergey PLATONOV

MAGNETIC PROPERTIES OF THE $GdFe_{0.95-x}Mn_xTi_{0.05}Si$ COMPOUNDS

It was found that the substitution of iron and manganese atoms with titanium atoms in the $GdFe_{0.95-x}Mn_xTi_{0.05}Si$ alloys leads to a significant increase in the Curie temperature and lattice parameter c. The increase in Curie temperature in the system depends on the composition and reaches maximum values at low manganese concentrations.

J.P22 Nadezhda SKULKINA

INFLUENCE OF POLYMER COATING ON MAGNETIC CHARACTERISTICS OF COBALT-BASED AMORPHOUS SOFT MAGNETIC ALLOY

This work presents studies of the polymer coating effect on the maximum magnetic permeability, and the magnetization distribution in the as-quenched ribbon of the amorphous alloy Co-Ni-Fe-Cr-Mn-Si-B. It is shown that the plane compressive stresses induced by the coating lead to a magnetization reorientation in the ribbon plane at the entire temperature range of the polymer coating formation: 90–130°C, which corresponds to the state with negative saturation magnetostriction.

J.P23 Vladimir LEPALOVSKIJ

MAGNETIC PROPERTIES OF Co-W THIN FILMS

The magnetic properties and structure of Co-W films were investigated.

J.P24 Maria YAKOVLEVA

UNUSUAL WEAK INCREASE OF CURIE TEMPERATURE AND LATTICE PARAMETERS IN $Pr_2Fe_{16.5}Zr_{0.5}$

Magnetic and structural properties of the $Pr_2Fe_{16.5}Zr_{0.5}$ compounds with Fe (atomic radius r = 1.274 Å) partially substituted by M = Zr (1.602 Å), Cr (1.360 Å), V (1.346 Å) or Ti (1.462 Å) were studied. The increases of the Curie temperature ΔT_c and the unit-cell volume ΔV are minimal in the case of Zr atoms (ΔT_c = 25 K, ΔV = 0.54 Å^3) in comparison with the much smaller atoms of Cr (ΔT_c = 49 K, ΔV =-0.46 Å^3)), V (45 K, 1.74 Å^3)) or Ti (49 K, 4.24 Å^3)). Neutron diffraction study was used to study this phenomenon.

J.P25 Aleksei MOISEEV

INFLUENCE OF A STRESS ANNEALING BY JOULE HEATING ON THE MAGNETOIMPEDANCE OF AMORPHOUS Co-BASED WIRES

Influence of a stress annealing by Joule heating on the magnetoimpedance of amorphous Co-based wires was investigated.

J.P26 Sergey KOMOGORTSEV

MAGNETIC COATINGS ON THE SPHERICAL SUB-MICRON PARTICLES OF ACRYLIC GLASS

A significant increase in magnetic hysteresis has established in the submicron core-shell particles Co- polymethyl methacrylate. It is discussed as a consequence of topological defects in micromagnetic structure of magnetic shell.

J.P27 Aleksandr POPOV

DEVELOPMENT OF HIGH-COERCIVITY STATE IN HIGH-ENERGY AND HIGH-TEMPERATURE Sm-Co-Fe-Cu-Zr MAGNETS UPON STEP COOLING

The focus of this work is a study of peculiarities of high-coercivity state formation in the quinary Sm-Co-Fe-Cu-Zr magnets in the course of the heat treatment with temperature decreasing stepwise. It is discussed that the Cu-enrichment at the interface of the $Sm_2(Co,Fe)_{17}$ and $Sm(Co,Cu)_5$ phases relaxes the stresses and increases the boundary-energy gradient, as well as H_c of the magnets.

J.P28 Anatoly KUCHIN

MAGNETIC PROPERTIES OF THE GdFeSi – GdTiSi SOLID SOLUTIONS

The GdFeSi and GdTiSi intermetallic compounds crystallize in the same tetragonal CeFeSi-type structure $P4/nmm$). The increase of Ti content in the $GdFe_{1-x}Ti_xSi$ system results in an increase in the lattice parameter c. The Curie temperature T_c increases due to the increase of polarization of delocalized 3d electrons. The easy direction of magnetization lies in the basal plane for GdFeSi. The anisotropy field equals $\sim$7 kOe at 90 K.

J.P29 Dmitry VELIKANOV

MAGNETIC PROPERTIES OF Cu_2MnBO_5 LUDWIGITE IN WEAK MAGNETIC FIELDS

For single-crystal Cu_2MnBO_5 ludwigite, the results of magnetization measurements in low and ultralow magnetic fields ($0 < |H| < 10$ Oe) are presented. SQUID magnetometer and VSM were used. Features of the magnetic moment behavior are shown. The dissimilarity in magnetic measurement data obtained with various types of magnetometers is observed. The reasons for this are discussed.

J.P30 Andrey URZHUMTSEV

INVESTIGATION OF MAGNETIZATION REVERSAL PROCESSES IN SYSTEMS Sm-Co

This paper is devoted to the study of the magnetic properties of Sm–Co compounds with a 2–17 structure depending on the composition and methods of heat treatment and the effect of this on the magnetization reversal process. The properties of this class of compounds obtained by the method of metal-ceramic technology and rapid hardening into tapes are investigated. Magnetic characteristics are evaluated in a field range up to 7 T and temperatures from 4–400 K.

J.P31 Nikita BUZNIKOV

MODELING OF MAGNETOIMPEDANCE EFFECT IN NANOSTRUCTURED MULTILAYERED FILMS

We propose a model to describe the field and frequency dependences of the magnetoimpedance in multilayered films. The approach is based on a simultaneous solution of lineralizied Maxwell equations and Landau–Lifshitz equation for the magnetization motion. Both the symmetric and nonsymmetric nanostructured multilayered films are studied. The model proposed allows one to explain qualitatively main features of the magnetoimpedance effect in multilayered films.

J.P32 Pavel EROSHENKO

PECULIAR MAGNETIC ANISOTROPY IN SQUARE FERROMAGNETIC NANODOT

J.P33 Natalia URUSOVA

MAGNETIC PROPERTIES OF $Sr_2Ni_{1-x}Mg_xMoO_6$ DOUBLE PEROVSKITES

The magnetic properties of polycrystalline $Sr_2Ni_{1-x}Mg_xMoO_6$ (x = 0, 0.25, 0.5, and 0.75) synthesized *via* a pyrolysis of glycerol with the addition of ammonium nitrate have been investigated. X-ray diffraction measurements were carried out at room temperature. Using Rietveld method were refined the structural parameters. Magnetic measurements were performed with the MPMS XL-7 in the temperature range (2–300) K, under the applied magnetic field of 1 kOe.

J.P34 Elizaveta SHEROKALOVA

FIELD-INDUCED HIGH-COERCIVE METASTABLE STATE IN THE ANTIFERROMAGNETIC COMPOUND Fe_xTiS_2

In the present work the phase transitions and magnetization processes in antiferromagnetic compounds $Fe_xTiS_{2y}Se_y$ (x = 0.25, 0.5) with an ordered layered crystal structure have been studied by using X-ray diffraction and measurements of the magnetization in steady and pulsed magnetic fields and magnetoresistance.

J.P35 Nadezda SELEZNEVA

EFFECT OF SELENIUM FOR SULFUR SUBSTITUTION ON THE MAGNETIC HYSTERESIS OF $Fe_{0.25}Ta(S,Se)_2$

In the present work we synthesized and studied the $Fe_{0.25}Ta(S_{1y}Se_y)_2$ compounds to reveal the effect of the Se for S substitution on the magnetization processes and magnetic hysteresis.

J.P36 Elena DENISOVA

NANOCOMPOSITE FeCo FILMS BASED ON ARABINOGALACTAN: SYNTHESIS AND MAGNETIC PROPERTIES

The FeCo films were synthesized by electroless plating with arabinogalactan (natural polysaccharide) or a sodium hypophosphite as reducing agents. The magnetic and structural properties of the composite materials are characterized by electron microscopy, X-ray diffraction and vibrating sample magnetometer. It was found that the iron ion concentration and type of reducing agent affect the surface morphology. The magnetic properties of the films are discussed in relation with the microstructure.

J.P37 Igor ALEKSEEV

INFLUENCE OF INITIAL MAGNETIC STATE ON INTERGRAIN INTERACTION IN NdFeB ALLOY

In this work, we prepared $Nd_2Fe_{14}B$ alloys to investigate a correlation between the intergrain interactions and magnetizing processes, starting from various demagnetized states. It is shown the AC demagnetization decreases the exchange interaction compared to the thermally demagnetization as well as make heavier magnetization process. The DC demagnetized and rotated of saturated sample on 90 degrees states will be examine next and results will be presented on the conference.

J.P38 Sergey PODOROZHNYAK

INFLUENCE OF SOLID ACIDITY ON GROWTH KINETICS, STRUCTURE AND MAGNETIC PROPERTIES OF CoP FILMS DURING CHEMICAL DEPOSITION

This paper presents the results of studies of the effect of pH of solutions on the kinetics of growth, microstructure and magnetic properties of chemically deposited films of CoP. It is shown that the kinetics of their growth can be described by the nucleation rate n and the nucleus growth rate α, and that at low pH $\alpha > n$, and at high pH, $n > \alpha$. The observed changes in the magnetic properties of the films are associated with the phase transformations of cobalt crystallites.

J.P39 Aleksey SHAHOV

DEPENDENCE OF COERCIVE FORCE ON THICKNESS IN THREE LAYER FILMS, OBTAINED BY CHEMICAL DEPOSITION

This article presents the results of the study of the coercive force of three-layer films obtained by chemical deposition depending on the thickness of non-magnetic and magnetic layers. The paper shows that for small thicknesses of a nonmagnetic interlayer, the magnitude of the coercive force is well described in the Neel approximation with a sinusoidal distribution of heterogeneity of the orange peel type.

J.P40 Alexey KUZMICHEV

TEMPERATURE DEPENDENCE OF INDUCED ANISOTROPY IN THE 111 PLANE OF THE THULIUM SUBSTITUTED IRON GARNET

J.P41 Peter SAVIN

NEGATIVE ANISOTROPY IN $Fe_{10}Ni_{90}$ FILMS

The possibility of formation in the iron-nickel films of the easy magnetization axis both along and across the technological magnetic field is demonstrated. A model for the formation of such anisotropy is proposed. The dependence of the formation of such anisotropy on the film thickness is demonstrated.

J.P42 Ljudmila KUZOVNIKOVA

MAGNETIC PROPERTIES OF BULK AMORPHOUS COMPOSITE COATING $Co_{58}Ni_{10}Fe_5B_{16}Si_{11}$-$Al_2O_3$, $Co_{58}Ni_{10}Fe_5B_{16}Si_{11}$-$ZrO_2$ and $Co_{58}Ni_{10}Fe_5B_{16}Si_{11}$-$SiO_2$ PRODUCED BY PLASMA SPRAY DEPOSITION AND DYNAMIC COMPACTION

This paper deals with progress in stabilization of amorphous or nanostructured state of bulk $Co_{58}Ni_{10}Fe_5B_{16}Si_{11}$ alloy prepared by different methods: plasma spray deposition and dynamic compaction. In order to increase resistivity of the material the bulk CoFeNiBSi – Al_2O_3, CoFeNiBSi – ZrO_2, CoFeNiBSi – SiO_2 composite materials were prepared. A comparison between the magnetic properties of the CoFeNi-SiB coating and composite coatings with different oxides was carried out.

J.P43 Maksim ANIKIN

MAGNETIC PROPERTIES OF R($Co_{0.88}Fe_{0.12}$)$_2$ QUASI-BINARY COMPOUNDS

In this paper, present a comparison of the magnetic properties of quasi-binary compounds $R(Co_{0.88}Fe_{0.12})_2$, where R = Gd, Tb, Dy, Ho, Er. In particular, the temperature and field dependences of the magnetization and the temperature dependences of the high-field susceptibility are presented. The obtained features of the high-field susceptibility are explained within the framework of the model of a weak magnetic sublattice.

J.P44 Ilya RYZHIKHIN

MAGNETIC PROPERTIES OF ALLOYS ($Sm_{1-x}Zr_x$)$Fe_{11}Ti$ (x = 0-0.2) WITH THE STRUCTURE OF THE TYPE $ThMn_{12}$

Nowadays the search continues for hard magnetic materials with improved magnetic characteristics in comparison with alloys based on $Nd_2Fe_{14}B$ phase. In the work were investigated samples $SmFe_{11}Ti$, $(Sm_{0.9}Zr_{0.1})Fe_{11}Ti$, $(Sm_{0.8}Zr_{0.2})Fe_{11}Ti$ based on the $ThMn_{12}$ phase as one of the promising phases. During the work, magnetic properties were investigated in a wide temperatures range. The best magnetic properties are realized on the $(Sm_{0.9}Zr_{0.1})Fe_{11}Ti$ sample at the annealing temperature of 1073 K.

J.P45 Roman BAULIN

Dy/Gd SUPERLATTICES STUDIED BY MÖSSBAUER REFLECTOMETRY IN TIME SCALE

We have performed nuclear resonant reflectivity measurements from Dy/Gd at 25.6 keV (5/2 $\rightarrow$ 5/2) resonant transition of ^{161}Dy. The quantum beats on the reflectivity spectra of reflectivity and the decay speed allow us to obtain the Dy magnetic hyperfine field and the relaxation time dependence in the 4–110 K temperature range. Nuclear resonance reflectivity shows possible mismatch between chemical and magnetic periods or a more complicated arrangement of the Dy interlayer magnetization.

J.P46 Vasilii KATAEV

EVIDENCE OF FINEMET-TYPE ALLOYS MAGNETIZATION IN WEAK FIELDS OF MAGNETIZATION ROTATION

The magnetization process of FeCoCuNbSiB alloy was studied in a weak permanent magnetic field. There are three kinds of samples: annealed in the longitudinal (L) and transverse (T) magnetic fields and without it (O). The type of magnetization determined the choice of samples with uniaxial anisotropy: in sample L–displacement of domain walls, in sample T–rotation of magnetization. Using magnetization curves and hysteresis losses measurements it was shown that magnetization in weak fields begins with reversible rotation in nanocrystalline alloys with low magnetic anisotropy.

J.P47 Tarek SOLIMAN

ALIGNMENT OF Fe NANOPARTICLES IN POLYVINYL ALCOHOL FILMS UNDER UNIFORM MAGNETIC FIELD

The properties of polymer nanocomposites with embedded nanoparticles are influenced by the alignment of these nanoparticles within the polymer matrix. The alignment of metallic nanoparticles along particular directions in a polymer matrix can be realized by applying an external uniform magnetic field. We assume that such orientation can enhance the magnetic, thermal, optical and mechanical properties of the polymer composites.

J.P48 Alexey GAVRILYUK

INFLUENCE OF PLASTIC DEFORMATION ON THE MAGNETIC AND MAGNETOELASTIC PROPERTIES OF RAPID-QUENCHED WIRES $Fe_{75}Si_{10}B_{15}$

The effect of the simultaneous treatment of a constant electric current in the density range j from $3.54{\cdot}10^7$ to $4.42{\cdot}10^7$ A/m^2 and applied tensile stresses of σ_{pre} = $1.74{\cdot}10^8$ Pa on the temperature field dependences of the ΔE-effect ($\Delta E/E_0 = (E_H - E_0)/E_0$) and dynamic magnetic properties of rapidly quenched wires of composition $Fe_{75}Si_{10}B_{15}$ with 0.05 m length of and $1.2{\cdot}10^{-4}$ m diameter was study.

J.P49 Rohit PATHAK

AB INITIO STUDY OF BORON AND PHOSPHORUS ADDITION OVER MAGNETIC PROPERTIES IN BINARY Fe-Pd ALLOYS

We present here the first principle density functional calculation of interstitially doped Fe-Pd alloys. Effect of B and P on magnetization, Curie temperature, and magnetic anisotropy have been studied. Our results show that the magnetization, as well as Curie temperature, decreases upon doping with both B and P whereas magnetic anisotropy increases in all considered ordered structures except FePd.

J.P50 Olga DEMIDENKO

MAGNETIC PROPERTIES RESISTANCE TO MARINE CORROSION ACTION OF BASED ON IRON STAINLESS STEELS

In this work we report a study of structure and magnetic properties resistance of based on iron OL52 and OL52/4 stainless steels to electrochemical corrosion action of Mediterranean, Black and Aegean sea waters at 25 °C. Comparative analysis of temperature dependences of specific magnetization before and after sea waters exposure confirms a high corrosion resistance of magnetic characteristics of the OL52 and OL52/4 stainless steels under such kind of corrosion.

J.P51 Elena KHUDINA

STRUCTURE AND MAGNETIC PROPERTIES OF MELT-SPUN RIBBONS OF Sm(Co,Fe,Cu,Zr)$_z$ WITH HIGH COBALT CONTENT

In this work the investigation of structure and magnetic properties of Sm(Co,Fe,Cu,Zr)$_z$ melt-spun ribbons (z = 11...12) after different heat treatments was performed. Samples after melt spinning were isothermally aged at temperatures 800, 700 and 600 °C and slow cooled. After annealing at 600 and 700 °C the phase structure is hexagonal Sm_2Co_{17} and CoFe; at 800 °C also a tiny amount of $SmCo_5$ and rhombohedral Sm_2Co_{17} phases appear. There is a slight growth of magnetic properties after annealing.

J.P52 Stanislav SKOROBOGATOV

SPIN EXCITATIONS OF $TmFeO_3$ STUDIED BY HIGH-RESOLUTION NEUTRON SPECTROSCOPY

Nowadays it is widely believed that the 3*d*-4*f* magnetic interaction gives a rise to the most of peculiar properties of orthoferrites ($RFeO_3$), however a low symmetry of the materials makes it difficult to construct a realistic microscopic magnetic model. In this work, we attempt to address this problem by studding a full spin-wave spectrum of $TmFeO_3$ using single-crystal time-of-flight neutron spectroscopy and discussed the results using crystalline electrical field and linear spin wave-theories.

J.P53 Vijayaragavan GANESAN

MAGNETIC PROPERTIES OF LIQUID PHASE SINTERING OF Sm-Fe-N POWDERS WITH LOW MELTING EUTECTICS

The present work reports the addition of low melting point $Sm_{63}Fe_5Cu_{22}Al_{10}$ eutectic alloy in $Sm_2Fe_{17}N_3$ melt spin ribbons. It is found that in the mixed powders α-Fe content decreases. It has been observed that increase in the weight percent of the eutectic alloy increases the coercivity of the $Sm_2Fe_{17}N_3$ powders.

J.P54 Darya KALIKINTSEVA

MAGNETIC AND DIELECTRIC PROPERTIES OF COMPOSITES BASED ON MAGNETIC MICROSPHERES

The effect of concentration on the permitivity and permeability of composites based on magnetic microspheres was studied.

J.P55 Aliaksei APLEVICH

RESULTS OF THE STUDY OF THE INFLUENCE OF ALKALINE, ACID AND SALT AQUEOUS SOLUTIONS ON THE SURFACE PROPERTIES OF NEODYMIUM MAGNETS

The action of alkali, acid, and salt aqueous solutions on the surface properties of $Nd_2Fe_{14}B$ magnets has been studied. A change in the friction coefficient relative to tungsten carbide and the wear of the treated samples was revealed. The impact of an aqueous solution of alkali leads to the most noticeable changes in surface roughness and friction coefficient. The most significant changes in the magnetic characteristics of the magnet surface are caused by the action of a salt aqueous solution.

J.P56 Wei XIA

STUDY ON MAGNETIC PROPERTIES LOSS OF PERMANENT MAGNET AT HIGH TEMPERATURE

In recent years, the demand for high temperature permanent magnets is becoming more and more urgent, especially in high-tech fields such as aerospace industry. The stability and reliability of high temperature magnets have been important problems, especially after the first high temperature exposure.

J.P57 Mariya GAVRILOVA

DEVELOPMENT OF $ThMn_{12}$-STRUCTURE COMPOUNDS FOR PERMANENT MAGNETS

Rare-earth (RE) alloys are a backbone of permanent magnets. The important properties of the permanent magnets include their coercivity, remanence and energy product. Severe plastic deformation has a great effect on magnetic properties of 4-*f* elements. In this work we report on the results of investigation of magnetic properties Sm-Zr-Fe-V alloys, which will be investigated by severe plastic deformation with high torsion pressure technique. The measurements were performed in magnetic fields up to 3 T and in the temperature range from 50 to 350 K.

Section H. Magnetism of strongly correlated electron systems

Poster area III.B

Chairpersons: Petr IGOSHEV, Alexander MOSKVIN

H.P1 Polina AGZAMOVA

HYBRID DFT CALCULATION OF ^{51}V NMR RESONANCES AND ORBITAL ORDER IN VANADATES WITH PYROCHLORE STRUCTURE

The detailed *ab initio* calculations of crystal structure and hyperfine interaction parameters will be presented for $R_2V_2O_7$ system (R = Ho, Er, Tm, Yb, Lu).

H.P2 Konstantin KOMAROV

THE EFFECT OF COULOMB REPULSION ON THE LONDON PENETRATION DEPTH IN CUPRATE SUPERCONDUCTORS

The London penetration depth λ in cuprate HTSCs within the spin-polaron approach, taking into account the Coulomb repulsion of holes, both on one oxygen ion and on the next nearest neighbor oxygen ions is studied. It is shown that, for the generally accepted values of the parameters of the spin-fermion model and the Coulomb repulsion make it possible to achieve substantially better agreement between the calculated temperature dependences of $\lambda - 2$ and experimental data.

H.P3 Ivan YATSYK

MAGNETIC PROPERTIES OF LANTHANUM STRONTIUM FERROMANGANITES DOPED WITH ZINC

The aim of this work is to study by ESR, magnetometry and Mössbauer effect methods magnetic properties of $La_{1-c}Sr_cMn_{1-x-y}Fe_xZn_yO_3$. Based on the obtained experimental data we assume the presence of ferromagnetically correlated regions in the investigated samples.

H.P4 Yuriy KNYAZEV

STRUCTURAL, MAGNETIC, AND ELECTRONIC PROPERTIES OF VANADIUM-SUBSTITUTED IRON WARWICKITE

We have synthesized high-quality $Fe_{2-x}V_xBO_4$ single crystals and carried out X-Ray diffraction, Mössbauer and magnetic investigations to estimate the influence of vanadium cations on warwickite properties.

H.P5 Timur SHAIKHULOV

SPIN CURRENT AND MAGNETIC MEASUREMENTS IN HETEROSTRUCTURE $SrIrO_3/La_{0.7}Sr_{0.3}MnO_3$

In this paper, we present the results of researching the spin current and magnetic measurements in the $SrIrO_3/La_{0.7}Sr_{0.3}MnO_3$ heterostructure.

H.P6 Vasily OGLOBLICHEV

SPIN FLUCTUATIONS OF THE URANIUM 5f-ELECTRONS IN THE UN ACCORDING TO ^{14}N-NMR DATA

The report presents the results of a study of the features of the charge and spin state of uranium magnetic ions in the paramagnetic phase of uranium mononitride by nuclear magnetic resonance spectroscopy on the nitrogen nucleus. Discussion of the obtained NMR results allowed us to find out the temperature dependence of the characteristic energy of spin fluctuations of 5f-electrons of the uranium shell. This dependence is close to the dependence typical for concentrated Kondo systems.

H.P7 Sergey GUDIN

DESCRIPTION OF THE MAGNETORESISTANCE OF $La_{1.2}Sr_{1.8}Mn_2O_7$ TAKING INTO ACCOUNT THE "SPIN-POLARON" AND "ORIENTATIONAL" MECHANISMS OF CONDUCTION

This work continues magnetic and electrical researches of the $La_{1.2}Sr_{1.8}Mn_2O_7$ compound. It presents the results of calculations of resistivity for the ferromagnetic temperature range from 5 to 90 K in a magnetic field from 0 to 90 kOe, the results of estimates of contributions from the "spin-polaron" and "orientational" mechanisms of conductivity in a CMR are given.

H.P8 Vitaliy GILMUTDINOV

MAGNETISM AND METAL-INSULATOR TRANSITION IN A TRIANGULAR LATTICE

We construct the ground state magnetic phase diagrams of the Hubbard model for the triangular lattice in the Hartree–Fock and slave boson approaches taking into consideration collinear and non-collinear (spiral) magnetic phases. We investigate the effect of electron correlations, doping and next-nearest neighbor hopping to the stability of magnetic structures. Half-filling phase diagrams allow us to study the metal-insulator transition and find a region of possible spin-liquid state formation.

H.P9 Yury KUZMIN

ELECTRONIC, MAGNETIC, AND OPTICAL PROPERTIES OF RRhSn (R = Dy, Ho) STANNIDES

The results of experimental and theoretical investigations of electronic, magnetic and optical properties of ternary compounds DyRhSn and HoRhSn compounds are reported. Spin-polarized calculations of the band structure were performing within GGA+U method which account for electronic correlations in the 4f-shell of rare-earth atoms. The measurements of thermal dependences of electrical resistivity, magnetic susceptibility, heat capacity and spectral characteristics were performed.

H.P10 Yulia SAMOSHKINA

INHOMOGENEITY OF MAGNETIC STATES IN POLYCRYSTALLINE Sr DOPED $PrMnO_3$ FILMS

In this work, the $Pr_{0.8}Sr_{0.2}MnO_3$ and $Pr_{0.6}Sr_{0.4}MnO_3$ polycrystalline films (d = 50–150 nm) were investigated in the temperature interval 100–350 K using electron magnetic resonance (EMR) spectroscopy and magnetic susceptibility measurements.

H.P11 Sergey NAUMOV

MAGNETIC PROPERTIES OF NON-STOICHIOMETRIC AND QUASY-BINARY $CeFe_2$-BASED COMPOUNDS DOPED WITH Mn

The study is devoted to a very topical issue of synthesizing new compounds in the family of *R*-based Laves phases and their investigating. $CeFe_2$ compound doped with Mn is unique, as Ce atoms possess peculiar electronic properties. The results of investigation of compounds by different methods are discussed.

H.P12 Viktor SOKOLOV

DONOR DBH EXCITONS AND MAGNETISM OF Mn DOPED ZnO

The results of the study of optical absorption, photo-EPR signals and magnetic measurements of hydrothermal single crystals of zinc oxide doped with manganese are presented. EPR signals under the illumination do not change. The value of the magnetic susceptibility corresponds to the Curie equation.

H.P13 Andrey KRASAVIN

GENERALIZED QUANTUM MONTE CARLO ALGORITHM IN EIGEN BASIS

New quantum Monte Carlo algorithm is presented, which is a generalization of the well-known continuous time world line (CTWL) algorithm. The new algorithm is "universal", *i.e.* it allows calculation of models defined in an arbitrary basis (in the basis of occupation numbers, in the momentum representation or in any other basis); only the matrix elements between basis functions are needed. The algorithm will be especially useful in studying complex multi-orbital low-dimensional models.

H.P14 Yaroslav ZHUMAGULOV

SUPPRESSING ANTIFERROMAGNETIC ORDER IN HALF FILIED HUBBARD-HOLSTEIN MODEL: DMFT STUDY

We study half filled Hubbard-Holstein model on cubic lattice with hoppings on nearest neighbors. Using DMFT based exact diagonalization technique we build phase diagram in plane of Hubbard parameter of interaction U and effective parameter of electron-phonon interaction.

H.P15 Alexandr LUKYANOV

ELECTRONIC STRUCTURE OF $BaBi_{(1-x)}K_xO_3$ SUPERCONDUCTORS: QMC CT-INT ALGORITHM

Motivated by newly increased interest in Bi-based superconductors, we have studied the electronic structure of BKBO using Hubbard-Holstein (HH) model. The choice of this model allowed us to take into account the electron-phonon coupling, which gives a more accurate description of electronic properties of BKBO. For solving HH model, quantum Monte Carlo algorithm in continuous time with interaction expansion has been implemented, providing efficient simulation of this system at low temperatures.

H.P16 Sergey STRELTSOV

RAMAN STUDY OF THE MAGNETOSTRUCTURAL TRANSITION IN THE HONEYCOMB Li_2RuO_3

We present results of the Raman study of the magnetostructural transition in the honeycomb lattice ruthenate Li_2RuO_3.

H.P17 Vyacheslav ZHANDUN

AB INITIO STUDY OF THE MAGNETIC, OPTICAL AND ELECTRONIC PROPERTIES OF SPINEL Co_3O_4 WITHIN DFT AND GW APPROACHES

The ab initio calculation of magnetic, electronic and optical properties of Co_3O_4 was performed within DFT-GGA and G0W0 approaches. Calculations within the framework of the G0W0 approach show a decrease in the spectral weights of the quasiparticle bands by almost half. The appearance of low-spin state of Co^{3+} ion is discussed. The spin state transition from low-spin state to high-spin state of Co^{3+} ion under pressure was found.

H.P18 Lubov GRAMATEEVA

MAGNETIC AND SPECTRAL PROPERTIES OF THE RCuGe (R = Tb, Dy, Ho, Er) COMPOUNDS

In this work, the electronic structure and optical properties of the RCuGe (R = Tb, Dy, Ho, Er) compounds were investigated. We carry out the spin-polarized calculations of band structure within LSDA+U method combining local spin density approximation and correction for strong electronic correlations in the 4f-shell of rare-earth ions.

H.P19 Semyon POLUKEEV

DEPENDENCE OF SUPEREXCHANGE INTERACTION IN CrO_2 ON PRESSURE

We analyzed the behavior of the exchange interaction of the chromium oxide and other oxides of transition materials with increasing pressure. A Hamiltonian of superexchange interaction was derived in analytical form due to the many-electron approach based on the X-operators representation and technique of projection operators generalized on arbitrary quasiparticle energy spectra of Mott-Hubbard insulator.

H.P20 Evgeny STEPANOV

QUANTUM SPIN FLUCTUATIONS AND EVOLUTION OF ELECTRONIC STRUCTURE IN CUPRATES

H.P21 Serguei SAVILOV

NEGATIVE IMAGINARY COMPONENT OF AC MAGNETIC SUSCEPTIBILITY IN $La_{0.6}Sr_{0.35}Ti_{0.05}MnO_3$

The offstoichiometric $(La_{0.6}Sr_{0.35})(MnTi_{0.05})MnO_3$ manganites was studied. According to XRD analysis the sample belonged to rhombohedral singony. Curie temperature of the sample equals to 185 K. (Anomalous) negative component of imaginary part of ac susceptibility is observed and discussed.

TUESDAY, 10.09.2019

Tuesday, 10.09.2019

Section B. Spin dynamics and magnetic resonances

Poster area III.A

Chairpersons: Leonid LUTSEV, Konstantin MIKHALEV

B.P1 *Irina ARAPOVA*

^{63,65}Cu NMR STUDY OF THE ANTIFERROMAGNET $CuCrO_2$

Based on the analysis of the ^{63}Cu NMR data in the multiferroic $CuCrO_2$, we have shown that the local charge distribution does not change significantly during the transition from the paramagnetic state to the state with long range magnetic order.

B.P2 *Maxim KOLKOV*

FORMATION THE FERRIMAGNETIC-LIKE STRUCTURE UNDER PARTIAL SUBTITUTION IN THE CRYSTAL $PbMn_{1-x}Fe_xBO_4$ (x = 0.1)

Were firstly grown the $PbMn_{1-x}Fe_xBO_4$ ($x \approx 0.1$) by spontaneous crystallization from melt solution. And their magnetic, resonance and heat capacity properties were studied. Substitution Mn^{3+} ions by Fe^{3+} changed type of magnetic ordering from ferromagnetic to ferrimagnetic-like and increasing value of the Cure temperature.

B.P3 *Andrey GRACHEV*

THE NONRECIPROCITY OF SPIN WAVES IN A FERROMAGNET/HEAVY METAL STRUCTURE INDUCED BY LOCAL DEFORMATIONS

In this work we will study the dynamics of spin waves in nanoelements under the influence of the Dzyaloshinsky-Moria interaction. The occurrence of the phenomenon of non-reciprocity, expressed in limited nanostructures with a certain configuration, will be investigated. Numerical simulations will be carried out using the finite element method to estimate the effect of local deformations created by the piezoelectric layer on the spin-wave transport of the layered structure.

B.P4 *Leonid SHELUKHIN*

ULTRAFAST LASER-INDUCED PRECESSION IN INDIVIDUAL DOMAINS OF MULTIFERROIC HETEROSTRUCTURE CoFeB/$BaTiO_3$

Multiferroic ferromagnetic/ferroelectric heterostructures offer a prospective possibility of manipulating magnetic order by electric field and vice versa. Using an optical pump-probe technique with micrometre spatial resolution we show excitation of the magnetization precession by femtosecond laser pulses in individual domains in CoFeB layer elastically coupled with a ferroelectric $BaTiO_3$ substrate by the change of the magnetoelastic anisotropy parameter.

B.P5 *Pavel POPOV*

THz-FREQUENCY OSCILLATIONS IN ANTIFERROMAGNETS WITH MAGNETOELASTIC COUPLING

We present an investigation of magnetization dynamics in multilayered structure of Pt-AFM-PZT, controlled by electric current and elastic stress. We derived and solved magnetization dynamic equations, and found the dependence of oscillation parameters from elastic stress and electric current. Found results indicate that the studied system is capable of THz-frequency signal generation, with possibility of tuning by electric current and exerted pressure.

B.P6 *Iulia IUSIPOVA*

PRECESSION FREQUENCY OF THE MAGNETIZATION VECTOR IN THE SPIN-VALVE FREE LAYER WITH LONGITUDINAL ANISOTROPY FOR VARIOUS MATERIALS

The object of this study is the main element of the nanoscale spin-transfer oscillators (STNO) architecture — a spin valve with a square cross section and longitudinal anisotropy. The frequency and amplitude of the output signal for STNO based on six different materials are calculated. Among these materials, the best in terms of the maximum frequency and the amplitude of oscillations and the lowest energy consumption are selected.

B.P7 Alexey SOLONININ

COMPARISON OF ANION REORIENTATIONAL MOTIONS AND CATION DIFFUSION IN $M_2B_{10}H_{10}$ (M = Na, K, Rb, Cs): NMR STUDY

NMR method has been used to investigate the reorientational motion of $[B_{10}H_{10}]^{2-}$ anions in the alkali-metal decahydro-closo-decaborate salts $M_2B_{10}H_{10}$ (M = Na, K, Rb, Cs) and the translational diffusion of Na^+ cations in $Na_2B_{10}H_{10}$.

B.P8 Sergey SAVCHENKO

MAGNON CAUSTICS IN FACE CENTERED CUBIC FERROMAGNETS

The report presents the results of a theoretical investigation of the peculiarities of magnon propagation in FCC ferromagnets. The model takes into account the exchange interactions between atom's spin and its nearest and next nearest neighbours that is applicable for rare earth ferromagnets, such as EuS. It is shown that magnon caustics can be observed for certain directions in EuS and EuS-like crystals; the depepndence of caustic direction on magnon frequency is determined.

B.P9 Vladimir SHAPOVALOV

SELF-ORGANIZATION IN THE UNIT CELL OF A SINGLE CRYSTAL OF SPINEL $Li_{0.5}Ga_{2.5}O_4$ AND SELF-DISTRIBUTION OF MAGNETIC IONS OF CHROMIUM Cr^{3+}

The present work demonstrates self-organization in a unit cell performed by 12 positions that are structurally and magnetically non-equivalent and self-distribution of chromium magnetic probes over these positions in single-crystal Li–Ga spinel $Li_{0.5}Ga_{2.5}O_4$. The Cr ions substitute for the Ga ones. The electron paramagnetic resonance spectrum of the □r^{3+} ions was studied within the temperature rang of 4.2÷300 □. The chromium concentration was 0.1 wt%.

B.P10 Vladislav POIMANOV

FEATURES OF THE SCATTERING OF EXCHANGE SPIN WAVES BY LAYER AND SUPERLATTICE OF BIAXIAL FERROMAGNETS

In this paper, a method is proposed for obtaining amplitude scattering coefficients of an exchange spin wave by the interface between biaxial ferromagnets, a magnetic layer, and a superlattice. The simultaneous presence of both spatially inhomogeneous waves traveling and forming near the border, the frequency dependence of which is non-monotonic, is a feature of the scattering of these waves. Taking them into account makes a closed system of boundary conditions for determining amplitudes.

B.P11 Valentin TEPLOV

MICROMAGNETIC MODELING OF MAGNETIZATION OSCILLATIONS EXCITED BY AUTORESONANCE IN THIN IRON-YTTRIUM GARNET FILMS

This topic is dedicated to micromagnetic modeling nonlinear osctillations of magnetisation caused by external magnetic field oscillations changings.

B.P12 Vladimir BESSONOV

TIME AND PROCESS OF RELAXATION OF FERROMAGNETIC RESONANCE IN YTTRIUM IRON GARNET FILM

The Brillouin scattering method is used to study the process of excitation and relaxation of ferromagnetic resonance in a thin film of yttrium-iron garnet in a linear and non-linear mode. The separation into primary and secondary magnons in terms of frequency, time, and wave vector was made. Spin-spin and spin-lattice relaxation times are studied dependence from excitation microwave power.

B.P13 Platon SOLOVEV

TWO-MAGNON SCATTERING IN NANOCRYSTALLINE THIN MAGNETIC FILMS

In this study we theoretically investigated the influence of the magnetization ripple structure on two-magnon relaxation processes in nanocrystalline thin magnetic films (TMF). The numerical calculation of high-frequency magnetic susceptibility based on a micromagnetic model of TMF showed that the magnetization ripple substantially affects the relaxation in nanocrystalline TMF.

B.P14 Sergey ODINTSOV

NANOSCALE LATERAL MAGNON STRUCTURES FOR NEUROMORPHIC COMPUTATION SYSTEMS

In this work, we consider structures consisting of laterally coupled yittrium-iron garner nano-waveguides and nano-waveguide – resonator. Such structures can be used as basic elements for creating various nanoscale devices, such as filters, couplers, multiplexers, etc. . The variation of spin-wave phase and amplitude in the proposed structure can be performed via the tuning of geometrical parameters, which can be used in planar topology of magnonic networks for neuromorphic computing.

B.P15 Alexander MARTYSHKIN

INTERCONNECTIONS ELEMENTS IN 3D MAGNON SYSTEM

This paper shows the properties of spin-wave excitations in the structure, which is a junction of thin-film magnetic structures, are investigated. It is shown that the proposed structure allows the transmission of spin-wave signals in an irregular structure in the propagation mode of a surface magnetostatic wave in a wide frequency range. The advantage of this approach is, firstly, the ability to create vertical connections in three-dimensional topologies of magnon networks.

B.P16 Mikhail KURKIN

THE MECHANISM OF SPIN SWITCHING STIMULATED BY FEMTOSECOND LINEARLY POLARIZED OPTICAL PUMP

The model of spin switching after femtosecond linearly polarized spin pumping is proposed. Such pumping blurs the Fermi surface ensuring the destruction of the spin polarization of the sublattices. The model option is indicated for their relaxation with a change in orientation relatively to the initial one.

B.P17 Vladimir FEL'K

FERROMAGNETIC RESONANCE IN MICRO AND NANOTUBES

The features of ferromagnetic resonance in micro and nanotubes for longitudinally and transversely magnetized infinite nanotubes are investigated using micromagnetic modeling.

B.P18 Kira SELEZNYOVA

MAGNETIC RESONANCE STUDIES OF $FeBO_3$ THIN FILMS

Iron borate, $FeBO_3$ epitaxial films on a diamagnetic $GaBO_3$ substrate have been studied by AFMR. The Dzyaloshinskkii-Moriya field, HD and the isotropic energy gap, H D2 have been determined at 77, 150 and 300 K. Comparison of the results for $FeBO_3$ film with those for the single crystal, shows that HD in both cases are in good agreement. Meanwhile, H D2 in film is much larger which can be due to mechanical stresses caused by the mismatch of the structural parameters of the film and the substrate.

B.P19 Irina VAZHENINA

ANGULAR DEPENDENCES OF UNIFORM AND NON-UNIFORM FERROMAGNETIC RESONANCE IN [CoFe/Cu]n MULTILAYER FILMS

Angular dependences of uniform and non-uniform ferromagnetic resonance in [CoFe/Cu]n multilayer films were measured.

B.P20 Vladislav GUBANOV

CONTROL OF LASER RADIATION BY THE DYNAMICS OF SPIN WAVES IN A CURVED YIG MICROWAVEGUIDE

In this work, the numerical simulations results of the spin wave propagation in a curved iron-yttrium garnet microwaveguide, as well as the propagation of spin waves when creating a temperature gradient by laser radiation in the waveguide curvature region are presented. It is shown that the modulation of the structure propertie leads to controlling the propagation of a spin wave.

B.P21 Valentin SAKHAROV

SPIN-WAVE EXCITATIONS IN YIG FILMS GROWN ON CORRUGATED SUBSTRATES

In this work, we present results of micromagnetic simulations and experimental study of yttrium-iron garnet film with thickness 0.15 mkm deposited by ion-beam sputtering on gallium-gadolinium garnet substrates having periodical array of etched grooves with the period 20 mkm, depth 1.5 mkm, width 8 mkm. It is shown that depending on magnetic field orientation, the modes of magnetostatic surface or backward volume waves appears in parts of the structure.

B.P22 Rauf ISKHAKOV

SWR IN PERIODIC AND GRADIENT MULTILAYER FILMS

SWR in periodic and gradient multilayer films was observed.

B.P23 Sergey VYZULIN

MAGNETIC RESONANCE IN ALLOY $Ni_{45}Cr_5Mn_{37}In_{13}$

The microwave properties of samples with the chemical formula $Ni_{45}Cr_5Mn_{37}In_{13}$ were investigated. Samples of such alloys may exhibit first-order magnetostructural (martensitic) transitions (MST). MST is not observed for all $Ni_{45}Cr_5Mn_{37}In_{13}$ samples. After heating to a temperature above 340° K and simultaneous magnetization, MST can be observed in such samples. Since the mechanism of such behavior of samples is not well understood, we used the magnetic resonance method to obtain new information.

B.P24 Vladimir SINITSYN

THEORY OF STANDING WAVES IN FINITE-SIZE SOLITON LATTICE

A theory of standing waves in a monoaxial chiral helimagnet is presented. Conditions of the experiment in thin films of $Cr_{0.33}NbS_2$ are reproduced in the model, in which we examine standing waves excited by a microwave field either parallel or perpendicular to the chiral axis.

B.P25 Maria MOROZOVA

FEATURES OF GAP SOLITONS PROPAGATION IN COUPLED MAGNONIC CRYSTALS

In present report, a theoretical study of a layered structure consisting of two magnonic crystals is carried out. In particular, the features of gap solitons propagation in such layered structure are investigated.

B.P26 Yurii SHARAEVSKII

MAGNONIC CRYSTAL WITH SATURATING ABSORPTION

This report presents results of study of features of autogeneration of pulse train of amplitude envelope, self-modulation modes and chaotic dynamics when different types of magnetostatic waves are excited in ring self-oscillating system with magnonic crysral. Conditions for the generation of gap solitons under pulsed excitation by signals at frequencies lying in Bragg stop band of magnonic crystal were investigated.

B.P27 Dmitry PLOKHOV

MACROSCOPIC QUANTUM COHERENT EFFECTS INDUCED BY ELECTRIC CURRENT IN DYNAMICS OF LANTHANIDE BASED SINGLE MOLECULE TOROICS

The dynamics of a quantum system with a large toroidal moment under the influence of an time-dependent electric current interacting with a toroidal moment is considered. The possibility of observing the quasi-anionic excitations, the Bloch type oscillations of the precession motion of the toroidal moment, the Stark-type resonances, the tunnel transitions between different precession modes is discussed.

B.P28 Yuriy NEPOCHATYKH

DYNAMIC SUSCEPTIBILITY ANOMALIES AT ORIENTATIONAL TRANSITIONS IN GARNET FERRITE FILMS

Dynamic susceptibility anomalies during orientational transitions.

B.P29 Zoya VOLKOVA

ELECTRONIC PHASE SEPARATION IN $Sr_{1-x}La_xMnO_3$ (x < 0.02): ^{17}O NMR DATA

In this abstract we present a ^{17}O NMR study of lightly electron-doped cubic $Sr_{1-x}La_xMnO_3$ ($x < 0.02$) manganites in the PM state.

B.P30 Evgeny KUZNETSOV

RESONANCE VARIATIONS OF MICROWAVE REFRACTION COEFFICIENT FOR PLATES WITH PERMALLOY FLAKES

Transmission of electromagnetic waves through a plate of metamaterial based on permalloy flakes and reflection from the plate is investigated at frequencies of 12 to 38 GHz in magnetic fields up to 12 kOe. For metamaterial sample with the volume portion of permalloy of 30%, the variation of reflection coefficient in magnetic field reaches 300%. These high variations are of interest to develop magnetic field driven microwave devices.

B.P31 Liudmila GONCHAR

ORBITAL DEPENDENCE OF SUPEREXCHANGE INTERACTION IN CHARGE-ORDERED MANGANITES

The microscopic reasons of superexchange interaction of charge ordered manganites are considered within the framework of orbital dependence model. The experimantal spectra of spin waves in 3D and layered manganites are taken into account.

B.P32 Alexander NIKOLAEV

LANDAU DIAMAGNETIC RESPONSE IN METALS AS A FERMI SURFACE EFFECT

It is demonstrated that the Landau diamagnetism of the free electron gas and a monovalent metal can be considered as a Fermi surface effect. The consideration includes two parts: 1) the free electron gas, 2) a monovalent metal. This approach also fully describes the oscillatory de Haas – van Alphen part of the diamagnetic susceptibility. It real metals the Landau diamagnetic susceptibility is anisotropic.

B.P33 Andrey BAZHANOV

THE CALCULATION OF SPIN-WAVE RESONANCE SPECTRA IN TWO- AND THREE-LAYER MAGNETIC FILMS

In the present work, we calculated the spectra of spin-wave resonance (SWR) in two- and three-layer magnetic films with dissipative or mixed spin pinning mechanisms. The calculation was based on obtaining the expression for high-frequency (HF) susceptibility in two- and three-layer films. Verification of the correctness of the proposed model for calculating the spectra of SWR was carried out by comparing the calculated spectra of two- and three-layer films with experimental spectra.

B.P34 Lucia ABALLE

MAGNETIZATION DYNAMICS DRIVEN BY STRAIN WAVES

Dynamic magnetization processes in Ni driven by surface acoustic waves are measured with a stroboscopic technique based on synchrotron PhotoEmission Electron Microscopy with X-ray Circular Magnetic Dichroism contrast. The magnetic response of Ni, mediated by magnetoelasticity, is studied in patterned microstructures, where we observe fast magnetic domain wall motion and coherent magnetization rotation, and in continuous thin films, where we find large angle amplitude strain spin waves.

B.P35 Mariya AMELCHENKO

SPIN WAVE PROPAGATION IN TWO-DIMENSIONAL LEFT-HANDED FERROMAGNETIC METAMATERIAL

It is well known that metamaterials are artificial structures that provide electromagnetic properties natural materials do not have. There is a class of metamaterials called left-handed metamaterials (LH) with both negative permittivity and permeability that support waves with anti-parallel group and phase velocities. In this paper we demonstrate the opportunity of creation a two-dimensional left-handed ferromagnetic metamaterial in which backward volume spin waves propagate.

B.P36 Sergey GRISHIN

SPIN-WAVE TRANSPORT IN A METASURFACE BASED ON YIG/Py SQUARE LATTICE

Multicomponent structures such as YIG-Py were developed and created. The structures are thin-film YIG microwaveguides with square lattices of Py disks (magnetic points) on top of it with different spatial periods. The static magnetic field is almost uniform and coincides with the external field in the peripheral areas of the cell. A decrease in the thickness of the magnetic point leads to a proportional decrease in the magnitude of the total magnetic moment.

B.P37 Anton PIKALOV

SPIN WAVES IN DOUBLE MAGNONIC CHAIN AND MAGNONIC SWITCHER

We study spin waves in a waveguide consisting of two parallel chains of spherical magnetic particles. We show that due to interaction between the chains the transmittance band known for single magnonic chains in such a system is splitted into two sub-bands cooresponding to two propagation modes, symmetric and antisymmetric. Interference between the modes occur as beating allowing for creating a magnonic switcher: device for controlling magnon amplitudes by applying external magnetic field.

B.P38 Dmitrii ROMANENKO

A CONTROLABLE SPIN-WAVE SIGNAL SPLITTER

In this letter we demonstrate controllable spin-wave splitter based on planar T-shape magnetic waveguide. The basic concept of the studied structure to create focused spin waves beams and to control them by an inhomogeneous external magnetic field. An inhomogeneous magnetic field is created by the DC current and lead to reflection of incident spin wave in the side arms of the T-shape junction.

B.P39 Vyacheslav IVANOV

RESEARCH OF DYNAMIC RANGE AND FAST TUNING SPEED TUNABLE BAND-PASS FILTERS ON MAGNETOSTATIC WAVES IN THE RANGE OF 1 GHz TO 20GHz

The results of an experimental research of dynamic range and speed tuning of fast tunable band-pass filters(BPF) on magnetostatic waves in the frequency range from 1 GHz to 20 GHz are presented.

B.P40 Evgeniy BEGININ

FMR STUDY OF 3D MAGNONIC CRYSTAL IN THE FORM OF MEANDER-TYPE YIG FILM

In the structures based on meander-like yttrium-iron garnet (YIG) films, spin waves (SW) can propagate in two or even three planes, thus, leading to possibility to form three dimensional (3D) magnonic devices. In this work, SW excitations in fabricated 3D magnonic crystal on the base of YIG film grown on the top of the corrugated GGG substrate were measured with the help of FMR technique and compared with the simulated spectrum for 3D structures with the meander-, trapezium-like profiles.

B.P41 Nikita LOBANOV

INFLUENCE OF METASURFACES ON SPECTRUM OF SPIN WAVES IN MAGNONIC CRYSTALS

This report presents study of spectrum of magnetostatic waves in magnonic crystal with metasurface. Metasurface is another magnonic crystal with a much shorter period. It is shown that in such a structure, position in spectrum of Bragg band gap changes, and additional band gap appear in band of first Bragg resonance.

B.P42 Yulia GUBANOVA

BACKWARD COUPLING IN LATERAL YIG MAGNONIC CRYSTAL

This paper shows that the creation of a waveguiding structure that combines the ideas of a magnon crystal and lateral structures provides an opportunity to develop devices for spatial-frequency selection of a spin-wave signal, which allows to partially solve the problem of creating magnon networks. Based on a numerical study, the features of the spin-wave signal branching mechanism are revealed.

B.P43 Vyacheslav LOZHNIKOV

MONTE-CARLO SIMULATIONS OF HEISENBERG MAGNETS BY WANG-LANDAU AND AB-INITIO METHODS

Last time there are a wide range of algorithms to explore the critical behavior of a complex spin systems. Wang-Landau algorithm is one of the last introduced Monte Carlo method, which allow us to get thermodynamical quantities of spin system by calculation density of states. In this work we investigate the critical behavior of the three dimensional Heisenberg model by parallel Wang-Landau algorithm developed with the using of OpenMP technology.

Section H. Magnetoelastic, magnetocaloric and shape memory effects

Poster area I.B

Chairpersons: Irina TERESHINA, Akhmed ALIEV

F.P1 Sabina EMELYANOVA

HALL EFFECT IN HEUSLER ALLOYS $Ni_{50}Mn_{36}Sb_{14-x}Me_x$ (*Me* = Al, Ge; x = 0; 1; 2; 3)

The purpose of this work is to find a parameter which can an unambiguously predict the behavior of structural transition temperatures (STT), while taking into account the physical nature of the real material using as an example alloys $Ni_{50}Mn_{36}Sb_{14-x}Me_x$ (*Me* = Al, Ge; x = 0; 1; 2; 3). Using Hall effect the concentration of charge carriers n^* was calculated and it was found that n^* can accurately predict behavior of the STT depending on the type of alloying element.

F.P2 Oksana PAVLUKHINA

FIRST-PRINCIPLES STUDY OF THE STRUCTURE AND PROPERTIES OF Fe-Rh-Ir ALLOYS

In this work, we present theoretical investigations of the structural and magnetic properties $FeRh_{1-x}Ir_x$ (x = 0.125, 0.25, 0.375) alloys. The properties are investigated by using the density functional theory calculations as implemented in the VASP package. We calculated the lattice constants, volume cell, partial and total magnetic moments for alloys.

F.P3 Mariya MATYUNINA

AB INITIO STUDY OF $DyFe_4Ge_2$ ALLOY

This work is present the results of ab initio study of phase transition $P42/mnm$–$Cmmm$ of the $DyFe_4Ge_2$ alloy. Ground state energy, magnetic moments, exchange interaction parameters J_{ij} and Curie temperature in the mean field approximation was obtained using by Korringa-Kohn-Rostoker Green's function method.

F.P4 Olga MIROSHKINA

PHONON SPECTRUM OF Ni-Mn-Ga: THE EFFECT OF SUPERCELL GEOMETRY

In this paper, the stability of $Ni_{2+x}Mn_{1-x}Ga$ ($x = 0$, 0.05, 0.1, 0.15, 0.2) Heusler alloys are studied with phonon dispersion curves calculations using the direct method and supercell approach.

F.P5 Mikhail ZAGREBIN

THE EFFECT OF EXCHANGE-CORRELATION POTENTIALS ON MAGNETIC PROPERTIES OF Fe-(Ga,Ge,Al) ALLOYS

The aim of this paper is a study of magnetic properties of Fe_3(Ga, Ge, Al) alloys within the local density approximation in the formulation of Vosko, Wilk and Nusair and the general gradient approximation in the formulation of Perdew, Burke, and Enzerhof. To study the magnetic properties of Korringa-Kohn-Rostoker method was used as they implemented in SPR-KKR package.

F.P6 Akhmed ALIEV

DEGRADATION OF MAGNETOCALORIC EFFECT IN CYCLIC MAGNETIC FIELDS

In this work, we present results of studying the magnetocaloric properties in various families of promising magnetic materials as La-Fe-Si, MnFe(AsP), FeRh, $Gd_5(GeSi)_4$ and Ni-Mn-X Heusler alloys in cyclic magnetic fields. It is found that continuously application of the cyclic magnetic fields results in degradation of the magnetocaloric properties of the studied materials. An explanation of the observed behavior of the MCE is given.

F.P7 Rimma ZAINULLINA

ELASTIC PROPERTIES OF $FeGe_2$ SINGLE CRYSTALS

The results of the investigation of temperature dependences of longitudinal and torsion sound wave velocities and the internal friction of $FeGe_2$ tetragonal single crystal along [100], [110] and [001] crystallographic axes are presented and discussed.

F.P8 Nikolay EKONOMOV

PARAMETRIC PHENOMENA IN THE COMPOSITE STRUCTURE FERROMAGNET-PIEZOELECTRIC

In the present work, the low-frequency parametric generation in the FM-PE structure was discovered and investigated for the first time. The magnetoelastic coupling in the FM layer of the structure plays the main role in the appearance of the parametric generation.

F.P9 Alexander KAMANTSEV

FUNCTIONAL PROPERTIES OF ALLOYS WITH INVERSE HEUSLER STRUCTURE Mn_2NiZ (Z = Ga, Sn, Sb)

The energies of the ground state, equilibrium lattice parameter and magnetic configurations (para-, ferro-, antiferromagnetic) of $Mn_2Ni_{1+x}Z_{1-x}$ alloys were calculated using Qauntum Espresso and SPR-KKR packages. The electrical resistivity, magnetization, and MCE in magnetic field up to 50 T were measured in manufactured alloys of Mn_2NiZ system.

F.P10 Alexey MASHIROV

MAGNETOCALORIC COOLING AT A TEMPERATURE OF ABOUT 20 K

The paper discusses the main physical processes as a result of magnetocaloric cooling at a temperature of about 20 K based on $DyNi_2$ alloy. The results of theoretical and experimental studies of the single cooling cycle process are presented.

F.P11 Pavel TERENTEV

COMPARATIVE STUDY OF MAGNETIC PROPERTIES OF NON-STOICHIOMETRIC $TbNi_5Mn_x$ AND QUASI-BINARY $TbNi_{5-x}Mn_x$ ALLOYS

Magnetic and crystallographic properties of $TbNi_5Mn_x$ non-stoichiometric alloys and $TbNi_{5-x}Mn_x$ solid solutions have been investigated. It was found that $TbNi_5Mn_x$ at $x \leq 1.5$ and $TbNi_{5-x}Mn_x$ at $x \leq 0.4$ crystallize in single-phase hexagonal $CaCu_5$ type structure. An increase of the magnetic ordering temperatures and a decrease of the magnetization of the both type compounds with an increase of the manganese concentration were found.

F.P12 Niyaz NURGAZIZOV

MFM STUDY OF DOMAIN STRUCTURE OF CoNi MICROPARTICLES CAUSED BY MECHANICAL STRESS

In work is presented the results of studying of the magnetic structure of CoNi microparticles by MFM tehnique and of the changing its structure caused by mechanical stress.

F.P13 Julia KALETINA

MARTENSITIC TRANSFORMATION AND MAGNETIC TRANSPORT PROPERTIES OF THE Ni-Mn-In ALLOY SYSTEM

Structure, electric and magnetic properties of ferromagnetic $Ni_{47}Mn_{42}In_{11}$ in which the martensitic transformation temperature closed to the Curie temperature of austenite were investigated.

F.P14 Nurizhat ABDULKADIROVA

MAGNETOCALORIC AND THERMOPHYSICAL PROPERTIES OF $LaFe_{11.2-x}Co_{0.7}Mn_xSi_{1.1}$ COMPOUNDS

Measurements of heat capacity, thermal diffusion, and the magnetocaloric effect of $LaFe_{11.2-x}Co_{0.7}Mn_xSi_{1.1}$ intermetallic compounds were carried out at x = 0.1, 0.2, 0.3 in the temperature range 80–300 K and in magnetic fields up to 1.8 T. The magnetocaloric effect is estimated by two methods: the method of modulating the magnetic field and from the heat capacity data. It was revealed that an increase in the content of Mn in the alloy composition leads to a shift of the TS towards the low temperatures, while the magnitude of the effect varies slightly.

F.P15 Alexander INISHEV

MAGNETIC PROPERTIES OF THE NON-STOICHIOMETRIC $TbCo_2Mn_x$ AND $TbCo_2Ni_x$ ALLOYS

$TbCo_2Mn_x$ ($x \leq 1$) alloys were synthesized and their crystal structure, heat capacity, magnetic and magnetocaloric properties were studied. Single-phase compounds with the $MgCu_2$-type structure were formed at < 0.4. In alloys with > 0.4, additional phases with the $PuNi_3$- and Th_6Mn_{23}-type structures form.

F.P16 Galina POLITOVA

LOW-TEMPERATURE MAGNETOSTRICTION AND DISTORTION IN THE RARE-EARTH PHASES OF LAVES

The multicomponent alloys (Tb,Dy,Gd)Co_2 were studied in a large temperature range 80–350 K and fields up to 1.2 T. Temperature dependencies of lattice parameters, magnetization and magnetostriction of these alloys have been obtained and analyzed. It is revealed that the temperature dependence of the magnetostriction has a complex nature, demonstrating extremes in the region of phase transitions.

F.P17 Ilya MAKAROCHKIN

MAGNETOCALORIC EFFECT IN TbCo-BASED MULTILAYERS

Magnetic and magnetocaloric properties were comparatively analyzed for the case of Tb-Co/Ti and Tb-Co/Si nanoscale multilayers prepared by radio frequency sputtering. The magnetic entropy change was quantified using the Maxwell relation based on the experimental magnetization data. The maximum magnetic entropy change for the Tb-Co multilayers is relatively small compared with the bulk Tb-Co. The so-called table-like dependence of the magnetic entropy change on temperature was observed.

F.P18 Denis SHISHKIN

MAGNETIC AND MAGNETOCALORIC PROPERTIES OF BALL-MILLED ALLOYS $Gd_{100-x}Ni_x$ (x = 25, 40, 50)

Magnetic and magnetothermal properties of ball-milled $Gd_{100-x}Ni_x$ (x = 25, 40, 50) alloys were studied. The Curie temperature is reduced substantially with the Ni composition, while the maximum magnetic entropy change value is increased. The refrigerant capacity for amorphous $Gd_{100-x}Ni_x$ alloys diminishes with increasing of the Ni concentration. The critical exponents δ were determined from data on the refrigerant capacity and magnetization isotherms at the related Curie temperatures.

F.P19 Sergey VYSOTSKY

MAGNETOELASTIC PROPERTIES OF ION-BEAM SPUTTERED YIG/GGG AND YIG/Si STRUCTURES

Magnetoelastic constants (B) of submicron iron yttrium garnet (YIG) films grown by ion beam sputtering on gadolinium gallium garnet (GGG) and silicon (Si) substrates were studied using the dependence of ferromagnetic resonance spectrum on the deformation of the films. Values of B were estimated, respectively, as ≈66% and ≈20% of the B value for “reference” submicron epitaxial single-crystal film YIG / YYY grown by liquid-phase epitaxy.

F.P20 Vasiliy GAVIKO

ANISOTROPIC MAGNETOELASTIC CONTRIBUTION TO THE THERMAL EXPANSION OF CRYSTAL LATTICE IN FePd ALLOY WITH THE L10 STRUCTURE

F.P21 Dmitriy SAVELIEV

MAGNETOSTRICTRIVE AND MAGNETOCAPACITIVE PROPERTIES OF MAGNETOACTIVE ELASTOMER CYLINDERS

Magnetostrictrive and magnetocapacitive properties of magnetoactive elastomer cylinders were investigated. It was shown that shear modulus of the sample influences on the following parameters of the magnetostriction curve: maximum and remnant deformations of the sample; fields, in which deformation occurs, and, in which deformations start decreasing. Also, the dependencies of the magnetoactive elastomers capacitance on magnetic field for samples with different shear modulus were investigated.

F.P22 Nikolai ERSHOV

ATOMIC STRUCTURE OF SOFT MAGNETIC IRON-BASED ALLOYS OF HIGH (Fe-Al) OR GIANT (Fe-Ga) MAGNETOSTRICTION

The results of X-ray diffraction study of the atomic structure of Fe7 and 9 at.% Al and Fe18 at.% Ga alloys are presented. Clusters of the B2 phase, regions with the D03 type ordering, and nanocrystals of the new B1 phase, which appear in Fe–Al with increasing aluminum content and enlarge after annealing in ferromagnetic state, are observed. The effect of heat treatments on the structure and phase composition is analyzed, their correlation with the level of magnetoelastic properties is shown.

F.P23 Aleksay GOLOVCHAN

EFFECT OF THERMAL PREHISTORY ON THE MAGNETOSTRUCTURAL AND FUNCTIONAL CHARACTERISTICS OF ALLOYS OF THE $Mn_{1-x}Cr_xNiGe$ SYSTEM ($x \leq 0.25$)

Using solid-phase quenching from the annealing temperature 850 °C, it is possible to change the nature of the magnetic transitions from the paramagnetic (PM) to the ferromagnetic state from the isostructural transitions of the 2nd order to the sharp magnetostructural transitions of the 1st order, characterized by a large slope, large entropy jumps, hysteresis etc.

F.P24 Igor SEKIRIN

DETERMINATION OF SATURATION MAGNETOSTRICTION OF AMORPHOUS Fe-Co-P-B RIBBONS: COMPARISON OF VARIOUS METHODS

We present the comparison of methods used for determination of the limiting magnetostriction constants for ribbons of amorphous alloys $Fe_{80-x}Co_xP_{14}B_6$, x = 23, 25, 28, 32, 40. We used methods of Narita (SAMR), Becker-Kersten, and direct measurement of tension caused by rectangular pulses of magnetic field. In the last method, we obtain also the dependence of magnetostriction on the magnitude of the applied field. The data obtained by all methods are in agreement with each other.

F.P25 Sergey BAKHAREV

FEATURES OF FOCUSING MAGNETOELASTIC WAVES IN YIG CRYSTALS

In the framework of the phenomenological approach, the focusing features of magnetoelastic waves in crystals with a cubic lattice are investigated. As an example, an elastic-isotropic YIG crystal is considered. The conditions for the formation of caustics of magnetoelastic waves are obtained. The directions of focusing of these waves are calculated. The focusing directions and caustics can be controlled by the external magnetic field.

F.P26 Leonid METLOV

FLUCTUATION OF MAGNETIZATION AND SUSCEPTIBILITY DURING MARTENSITE TRANSITION IN HEUSLER ALLOYS

We will discuss about fluctuation phenomena in magnetic characteristics as magnetization and magnetic suscebility during structural phase transition (martensite transition) in Heusler alloys.

F.P27 Anton SHADRIN

MAGNETOCALORIC EFFECT IN THE 2D DILUTE ISING SYSTEM

The dilute Ising model is one of the basic models in the theory of magnetic systems with disorder. We consider the magnetocaloric effect (MCE) for the 2D-Ising model with nonmagnetic mobile impurities. We discuss the possibility of controlling the parameters of MCE by changing the concentration of nonmagnetic impurities. We investigate the system using the classic Monte Carlo method. We discuss the obtained dependences of the MCE parameters on the impurity concentration and temperature.

F.P28 Khotam MIRZOKULOV

ANISOTROPY OF THE MAGNETO CALORIC EFFECT IN THIN MAGNETIC FILMS OF NICKEL

The angular dependence of the anisotropy of the magneto caloric effect (MCE) in thin magnetic Nickel films in the crystallographic directions is calculated and experimentally established (100), (110), (111). The results of comparison of the calculated data with the experimental data showed a qualitative explanation of the anisotropy of MCE and their agreement with the model of uniform magnetic rotation at the orientation of the magnetic field near the easy magnetization axis.

F.P29 Andrey ARKHIPOV

MAGNETIC AND MAGNETOCALORIC PROPERTIES OF Gd MELT-SPUN RIBBONS

Gd ribbons were prepared by melt spinning in a purified argon atmosphere. From the magnetic isotherms, the magnetic entropy change was derived using the Maxwell relation. Its value was not less than for the bulk Gd. Such melt spinning modes were selected, including the use of the crucible scanning on the surface of the copper wheel, which allows to obtain ribbons with the same value of magnetocaloric effect in a relatively wide range of copper-wheel speed.

F.P30 Valentina ZHUKOVA

TUNING OF MAGNETIC PROPERTIES OF HEUSLER-TYPE GLASS-COATED MICROWIRES

After annealing of NiMnGa microwires a ferromagnetic ordering is obtained with Curie temperature of about 300 K. The hysteresis observed on temperature dependence of magnetization in annealed samples and magnetic softening at about 260 K have been interpreted as the first order phase transformation. Observed changes have been discussed considering internal stresses relaxation after annealing, recrystallization process and magnetic ordering of phases in as-prepared and annealed samples.

F.P31 Mikhail DROBOSYUK

THE MAGNETOCALORIC EFFECT IN Ni-Co-Mn-Sn HEUSLER ALLOYS

The aim of this work was to investigate the magnetocaloric effect in Co-dopped Ni-Mn-Sn Heusler alloys near the room temperature. Polycrystalline ingots were prepared by arc-melting method in argon atmosphere. The adiabatic temperature change ΔT_{ad} of the sample was registered by the direct method by means of the thermocouple. The magnetic field up to 2.08 T was produced by the Halbach permanent magnet and was measured by the Hall probe.

F.P32 Maxim ULYANOV

LOW TEMPERATURE MAGNETOCALORIC MATERIALS Gd-In SYSTEM FOR OF CRYOGENIC GAS LIQUEFACTION BY MAGNETIC COOLING TECHNIQUE

The aims of this work are to report on experimental measurements of the low temperature magnetocaloric materials based on GD-In compounds for magnetic refrigeration in cryogenic application. Special accent made for investigation an influence of severe plastic deformation on magnetocaloric properties of such alloys.

F.P33 Danil BAIGUTLIN

INVESTIGATION OF THE STRUCTURAL, MAGNETIC, AND THERMODYNAMIC PROPERTIES OF Ni_2MnGa IN THE METAGGA APPROXIMATION

This paper compares the structural, magnetic, and elastic properties of the full Ni_2MnGa Heusler alloy obtained by scanning meta-GGA (strongly constrained and appropriately modified), GGA, and GGA+U functionals to approximate the exchange correlation potential.

F.P34 Artem OKULOV

MULTICOMPONENT ALLOYS WITH THERMALLY, MECHANICALLY AND MAGNETICALLY CONTROLLED SHAPE MEMORY EFFECTS

This paper presents the results of a systematic study of the influence of the chemical composition on the structure, phase transformations and physical properties of binary and quasi-binary Ti-Ni, TiNi-TiFe, TiNi-NiCu, NiMn-NiGa and Ni_2MnGa-Ni_3Ga systems, capable of experiencing thermoelastic martensitic transformations (TMT) and related with them thermally, mechanically, or magnetically controlled shape memory effects (SME). The studies were carried out by measuring electrical resistivity, elastic moduli, transmission and scanning electron microscopy (TEM and SEM), diffraction of electrons and X-rays. The effect of alloying with a third component on the behavior of critical temperatures and the sequence of TMTs has been established, and their generalized diagrams have been constructed. It is shown that the morphology of thermoelastic martensite is a hierarchy of packages of thin coherent crystals.

F.P35 Tatiana KAMINSKAYA

STRUCTURAL, MAGNETIC AND MAGNETOCALORIC PROPERTIES OF $NdPrFe_{14}B$ AND ITS HYDRIDES

$NdPrFe_{14}B$ and its hydrides $NdPrFe_{14}BH_x$ (= 2.7; 4.3) were obtained and investigated. Microstructure and domain structure were investigated by the atomic and magnetic force microscopy. Magnetic studies were measured in pulsed magnetic fields up to 60 T. It was established that hydrogenation has a significant effect on the structure and magnetic properties of a multicomponent alloy $NdPrFe_{14}B$. The magnetocaloric effect in the range of spin-reorientation transition decreases significantly.

Section M. Magnetism in biology and medicine

Poster area III.B

Chairpersons: Sergey KOMOGORTSEV, Felix BLYAKHMAN

M.P1 Evgeniya MAKSIMOVA

INFLUENCE OF VARIOUS FORMS OF IRON ON GROWTH OF CHLORELLA VULGARIS BEIJER CULTURE

In this work we perform a comparative study of the toxic effect of MNPs of iron oxide and ions of bivalent and trivalent iron in the composition of sulfates on the growth of an intensive culture of Chlorella vulgaris Beijer (strain IRK-A46).

M.P2 Igor KHLUSOV

NONUNIFORM UPTAKE OF IRON OXIDE MAGNETIC NANOPARTICLES BY LYMPHOCYTES

Transmission electron microscopy found 24-h intracellular inclusion of separate iron oxide magnetic nanoparticles (MNPs) in a cytoplasm of human blood mononuclear leukocytes (98% of T-lymphocytes) while chitosan-stabilized water-based ferrofluid was used. An absence of chitosan caused strong increase in MNP intracellular number, their agglomeration and accumulation in cell organelles. Cell impacts of magnetic fields will depend on distinct features of MNP distribution inside T-lymphocytes.

M.P3 Yuliya BAKHTEEVA

MAGNETIC FIELD ASSISTED SEPARATION OF TiO_2 NANOPARTICLES FROM WATER SOLUTIONS

Fe_3O_4-SiO_2, Fe-C-COOH and Fe-C-SO_3H composites were used as magnetic flocculants of TiO_2 nanoparticles. The sedimentation rate is defined by the heteroaggregates formation. The aggregate sizes depend on pH of water media, size, the mass content of the flocculants. The research is important for development of innovative water cleaning techniques.

M.P4 Nikita KOZLOV

DESIGN AND DEVELOPMENT OF SMALL CHAMBER FOR FERROGEL STUDIES USING MAGNETOIMPEDANCE EFFECT

Ferrogels are soft biomimetic composite materials widely introduced in the area of biomedical applications. We describe our experience in design and development of small chamber for ferrogel studies using magnetoimpedance effect.

M.P5 Anastasiya TIMOFEEVA

DETERMINATION OF THE MEASUREMENT MODE FOR MAGNETOIMPEDANCE THIN FILMS WITH SYMMETRY FEATURES

Static and dynamic magnetic properties of multilayres with asymmetric layers configuration were investigated. An experiments on non-destructive testing were done for thin film samples on the basis of set meaurment mode.

M.P6 Nikolai BRUSENTSOV

SUPERPARAMAGNETIC NANOPREPARATIONS IN THE EARLY DIAGNOSTICS AND TREATMENT OF CANCER

We have developed: super-paramagnetic nanoparticles of magnetite citrate (SNMC); the combination of SNMC-Magnevist, which caused a reduction in the imaging time of the centers of proliferation of malignant cells by 2–3 days; a combination of a 40% aqueous sol of SNMC-Inox, which increased the lifespan of mice by 280%.

M.P7 Tatyana DENISOVA

CHANGES IN MORPHOTIPE IN THE POPULATION OF E.COLI IN THE PRESENCE OF METAL CONTAINING NANOPARTICLES

Influence of iron-containing nanoparticles on the variability of E.coli was investigated. Macro- and micromorphometric characteristics of bacteria were studied. A change in the morphology of the microbial cell with a high concentration of MNPs leads to abnormal growth and disruption of the division process, as evidenced by the formation of involutional forms among which stand out long filiform, as well as curved or swollen cells.

M.P8 Elena SIMONOVA

INFLUENCE OF METAL CONTAINING NANOCOMPOSITES ON THE KINETICS OF MICROBIAL POPULATION DEVELOPMENT

Studies have been conducted to study the effect of iron-containing nanoparticles at concentrations of 1.0 and 10.0 MPC for Fe^{3+} on the growth and development of the microbial population of E.coli. On the basis of the obtained results, it was found that nanoparticles affect the growth characteristics of E.coli, related to human gram-negative prokaryotic microflora. The level of biological activity of nanoparticles depends on their concentration.

M.P9 Sergey STOLYAR

MAGNETIC RESONANCES IN NANOSCALE PARTICLES OF BIOGENIC FERRIHYDRITE

Microorganisms are well known in microbiology and geochemistry, due to their ability to mineralize large amounts of iron. One such microorganism is Klebsiella oxytoca, which synthesizes polysaccharide-ferrihydrite nanoparticles. In this work, we used the biomass of Klebsiella oxytoca microorganisms to obtain ferrihydrite nanoparticles. The obtained samples were investigated by the methods of ferromagnetic resonance, vibration magnetometry, Mössbauer spectroscopy.

M.P10 Elena CHEREMISKINA

MAGNETIC COATINGS OF Fe(C) SYNTHESIZED WITH ARABINOGALACTAN

Currently, a new approach to metal recovery is rapidly developing, known as green synthesis. Extracts of natural plant products are used in green synthesis. Natural extracts are generally non-toxic and function as a dispersing and coating agent, minimizing oxidation and agglomeration processes. In this work, as a reducing agent, we used arabinogalactan, isolated from larch, to obtain an iron coating on a copper substrate.

M.P11 Tatyana SMOLYAROVA

MAGNETIC PROPERTIES OF FERROMAGNETIC NANODOT ARRAY

Magnetic nanodots Au/Ni/Au obtained using the electrone beam lithography and ordered in square array. Measured hysteresis loops of the array can be considered as averaged signal of single nanodot. The comparison between experimental and simulated investigations of hysteresis loop presents that quantitative agreement is possibly accessible in the model of polycrystalline nanodot structure.

M.P12 Anna CHLENOVA

MULTILAYERED MAGNETOIMPEDANCE SENSITIVE ELEMENT WITH CARBON COATING

Thin multylayered FeNi/Cu films were produced, structurally and magnetically characterised for high frequency range. Influense of defective carbon-like layer on surface-sensetive magnetoimpedance effect was established depending on the treatment time.

M.P13 Vladimir KOROLEV

SYNTHESIS AND STUDY OF THE COLLOIDS BASED ON THE ANISOTROPIC STRONTIUM HEXAFERRITE NANOPARTICLES FOR MAGNETOMECHANICAL CELL DESTRUCTION

We have studied the dynamics of the hard magnetic strontium hexaferrite nanoplatelets behavior in AC magnetic fields in viscous solvents which are the model for intercellular environment, determined the cytotoxicity of the colloidal particles with respect to endothelial cells Ea.hy 926 and conducted pilot experiments on magnetomechanical cell destruction in vitro with qualitative and quantitative assessment of method's efficiency.

M.P14 Vladimir KHARITONOV

DEVELOPMENT OF THE MATHEMATICAL MODEL OF A SENSOR MOTION IN A MAGNETIC FIELD

This article describes the process of developing a mathematical model for determining the spatial position of a sensor in a magnetic field created by magnetic dipoles. Within this model, according to the readings of MEMS sensors, which are a combination of such sensors as an accelerometer, gyroscope and magnetometer, the position and angles of inclination of the sensor are calculated in real time, and its movement is visualized.

M.P15 Zhimba NAMSARAEV

HARDWARE AND VISUALIZE FOR DEVELOPMENT OF THE MODEL OF A SENSOR MOTION IN A MAGNETIC FIELD

This article describes the prototype device, how to get data from it, and how to use that data for visualization in a virtual environment.

M.P16 Egor SHUNKIN

10-YEAR USABILITY OF MAGNETITE NANOPARTICLES PREPARED VIA EXPLODING WIRE METHOD

The structural, magnetic and cytotoxic features of magnetite nanoparticles (MNPs) prepared via exploding wire method have not changed for 10 years while nanopowder was stored in dark place under air atmosphere at room temperature. Long-term stability of MNPs is very useful for their biomedical development as inorganic carriers for cancer diagnostics and treatment and for a wide variety of other illnesses.

M.P17 Mikhail ZHARKOV

TWO TYPES OF MAGNETITE-CONTAINING LIPOSOMES FOR MAGNETO-CONTROLLED DRUG RELEASE

The paper is dedicated to a comparative study of the marker substance release from magnetic liposomes in an alternating magnetic field. We have investigated two types of liposomes: 1) magnetic shell liposomes (MSLs) containing magnetite nanoparticles in the coating lipid bilayer and 2) magnetic core liposomes (MCLs) containing the nanoparticles in the internal volume (water phase).

M.P18 Natalia ABRIKOSOVA

INVESTIGATIONS OF INTERACTIONS OF NANOPARTICLES WITH CELLS FOR THE DEVELOPMENT OF THE NEXT GENERATION MRI CONTRAST AGENTS

Magnetic nanoparticles have been extensively investigated for various applications including, magnetic resonance imaging (MRI). In the present work, synthesis, purification, and surface modification of crystalline Gd_2O_3-based nanoparticles (GdNPs) have been performed. Significant modification of the relaxation times for samples of macrophages incubated with GdNPs caped with Sorbitol and their improved biocompatibility were observed.

M.P19 Ilya BYZOV

QUANTIFICATION OF MAGNETIC NANOPARTICLES CAPTURE IN CELLS BY T2 MEASUREMENTS

The possibility of using the transverse relaxation time T2 of protons in aqueous media for quantitative measurement of the capture of magnetic nanoparticles by cells has been studied and demonstrated. The measurement of T2 was performed on a portable original NMR relaxometer with a measuring cell for a standard well of a biological plate. The novelty of the approach is that quantitative measurements of the capture kinetics were carried out using measurements of the proton relaxation time of the nutrient medium, which is determined by the remaining number of magnetic particles (not captured by the cells) in the medium. Two types of magnetic nanoparticles were synthesized to study the kinetics of capture: magnetite particles Fe_3O_4 and composite particles Fe@C with an iron-carbon shell structure. The surface of the particles was functionalized with amine- and carboxyl groups to increase their hydrophilicity. The particles were placed in a culture medium with HeLa cells as a model medium. It was established that in the investigated range of concentrations for functionalized nanoparticles in a liquid medium the relaxation time is a linear function of the concentration. The capture of aminated particles of Fe@C cells is established by microscopy and NMR-relaxometry by measuring the time T2. It is shown that the proposed method makes it possible to register tiny concentrations of trapped magnetic nanoparticles equal to $\sim$tens of pg/cell.

Section K. Magnetic semiconductors, multiferroics, topological insulators

Poster area I.A

Chairpersons: Vladimir MEN'SHENIN, Yuri SUKHORUKOV

K.P1 Elena MOSTOVSHCHIKOVA

THE EFFECT OF OXYGEN CONTENT ON CHARGE CARRIERS ANISOTROPY IN LAYERED COBALTITES

The reflection spectra of $EuBaCo_{1.9}O_{5+d}$ single crystals with d = 0.4, 0.25 and 0.15 have been studied. The data have obtained from (001) and (120) planes of the crystals. The difference between the evolution of the spectra with decrease of oxygen content observed for (001) and (120) planes is discussed.

K.P2 Mikhail SEMKIN

MAGNETIC PROPERTIES OF $LiNi_{1-x}Co_xPO_4$ MULTIFERROICS

We present the magnetic properties of $LiNi_{1-x}Co_xPO_4$ multiferroics, with x = (0–0.5), and their analysis of concentration dependences. The $LiNi_{1-x}Co_xPO_4$ multiferroics have been synthesized by a glycerol-nitrate method. X-ray diffraction measurements were carried out at room temperature. Structural parameters were refined by Rietveld method. Magnetic measurements were performed with MPMS XL-7 over the temperature range (2–300) K, under the applied magnetic field of 500 Oe.

K.P3 Mikhail PLATUNOV

MAPPING THE TWINNING IN MULTIFERROIC SINGLE CRYSTALS: $SmFe_3(BO_3)_4$

Here, we report a technique — X-ray Natural Circular Dichroism (XNCD) imaging — which enables spatially resolved mapping of X-ray optical activity of materials, representing the X-ray analogue of a polarization-contrast microscope.

K.P4 Alexey KUDRIN

CONTROL OF CARRIER CONCENTRATION AND FERMI LEVEL POSITION IN (In,Fe)Sb MAGNETIC SEMICONDUCTOR BY ION IRRADIATION

The influence of He^+ ion irradiation on the transport and magnetic properties of epitaxial layers of a diluted magnetic semiconductor (DMS) (In,Fe)Sb has been investigated. Results show that the magnetic properties of (In,Fe)Sb DMS are quite resistant to significant changes of charge carrier concentration and Fermi level position. Results confirm a weak interrelation between the ferromagnetism and charge carrier concentration in (In,Fe)Sb, that is fundamentally different from Mn doped III-V DMS.

K.P5 Roman DUBROVIN

MICROSCOPIC MECHANISMS OF THE SPONTANEOUS MAGNETODIELECTRIC EFFECT IN MODEL ANTIFERROMAGNETIC FLUOROPEROVSKITES $KCoF_3$ AND $RbCoF_3$

We report on investigations of lattice dynamics and spontaneous magnetodielectric effects using far-infrared and low-frequency dielectric spectroscopy in model cobalt antiferromagnetic fluoroperovskites $KCoF_3$ (T_N = 115 K) and $RbCoF_3$ (T_N = 101 K) in the temperature range of 5–300 K. It is found that the spontaneous magnetodielectric effect in both crystals is caused by frequency shift of transverse and longitudinal phonons due to spin-phonon coupling.

K.P6 Vasiliy CHISTYAKOV

THICKNESS DEPENDENCY OF CONDUCTIVITY IN TI Bi_2Se_3

The results of this work made it possible to experimentally "separate" the bulk and surface contributions. The obtained results can be used for "separation" and evaluation of the values of surface and bulk conductivity in TIs and systems with non-uniform distribution of direct current over the cross section of the sample.

K.P7 Irina GUDIM

MAGNETIC PROPERTIES OF $Ho_{0.9}Er_{0.1}Fe_3(BO_3)_4$

In this work the experimental and theoretical investigations of the field and temperature dependences of magnetization Ma,c(B) and the temperature dependences of the magnetic susceptibility ca,c(T) of $Ho_{0.9}Er_{0.1}Fe_3(BO_3)_4$ have been performed.

K.P8 Nikolay SOLIN

SPIN STATE OF Co^{3+} IONS, EXCHANGE BIAS IN LAYERED $RBaCo_2O_{5.5}$ (R = Eu, Gd, Tb) COBALTITES

A new scheme of the spin states of Co^{3+} ions in the $GdBaCo_2O_{5.5}$ and $TbBaCo_2O_{5.5}$ metal-insulator transition was proposed, taking into account the paramagnetic contribution of the Gd^{3+} and Tb^{3+} ions, which does not contradict the known structural data. The nature of the unidirectional anisotropy of the electrical resistance, the exchange bias field (EB) of $RBaCo_2O_{5+d}$ is discussed. The presence of multi-domain and single-domain particles explained the features of the effect of training.

K.P9 Leonid OVESHNIKOV

MAGNETIC AND TRANSPORT PROPERTIES OF BISMUTH SELENIDE THIN FILMS WITH FLAT Eu-RICH INCLUSIONS

We studied the magnetic and magnetotransport properties of epitaxial Bi_2Se_3 films with flat Eu-rich inclusions, observed via electron microscopy. Estimations suggest that the interaction between inclusions have a dipole-dipole nature, which give rise to the AFM stacking phenomena and agrees well with the experiment. We analyze the weak antilocalization effect and linear magnetoresistance in studied films. Our data suggest the conservation of nontrivial phase in the wide range of Eu content.

K.P10 Leonid OVESHNIKOV

SYNTHESIS AND FUNCTIONAL CHARACTERIZATION OF POLY(P-XYLYLENE)–MnSb NANOCOMPOSITE FILMS

In this work, we report the synthesis of PPX–MnSb nanocomposite films and provide data on their functional characterization. Studied films with thickness below 1 μm were synthesized on Si substrates using vapor deposition polymerization method. Atomic force microscopy revealed grain-like morphology of composite film and suggested the formation of MnSb nanoparticles. Studied films exhibit pronounced FM response even at room temperature.

K.P11 Dmitry BURDIN

MAGNETOELECTRIC STRUCTURE WITH INTEGRATED CURRENT CARRYING ELECTRODES

Two layer laminated structure PZT-Metglas was excited by linear current, passed through its layers, through outer conductive strip and also by magnetic coils. We measured resonance magnetoelectric voltage, generated by the piezoelectric layer, versus DC magnetic field. For linear currents of 200 mA we've got equivalent field values of about 0.15 Oe. Most effective linear current excitation was observed when using ferromagnetic layer as a current carrying electrode.

K.P12 Sergej SOLOV'YOV

ANTIFERROMAGNETIC STATES OF $BiFeO_3$ SINGLE CRYSTAL MULTIFERROIC IN EXTERNAL MAGNETIC FIELD

In our presentation we analyse the stability of magnetic states and transformation of incommensurate spin structure of $BiFeO_3$ single crystal in external magnetic field using the developed theoretical model. We also present magnetization curves calculated for three crystallographic directions: along [111], [1$\bar{1}$0], [11$\bar{2}$]. Such calculations could roughly establish accordance between experimentally-achieved magnetization curves and corresponding magnetic states.

K.P13 Lorenz BERGEN

LOW FREQUENCY PHONONS IN RARE EARTH LANGASITES

Rare-earth langasites are characterized by geometric magnetic frustration exhibiting magnetoelectric effects, and may even support a spin-liquid ground state. Our study presents spectra of the $N_3Ga_5SiO_{14}$ langasite using far-infrared reflection spectroscopy. Experiments have been performed with polarized radiation along different crystallographic axes. Phonon excitations at unusually low frequencies are observed that brings the crystal structure of langasites close to a lattice instability.

K.P14 Oksana ROMANOVA

PHOTOINDUCED DIODE EFFECT IN MULTIFERROICS $BiMn_xFe_{1-x}O_3$

The creation of multiferroics with a narrow gap in the electron excitation spectrum and high absorption of the electromagnetic radiation in the visible and IR ranges is promising for new optoelectronic applications, attenuators, sensors, and memristor devices. The aim of this work was to elucidate the mechanism of the photoinduced diode effect in the near-IR range and temperature stability for multiferroics $BiMn_xFe_{1-x}O_3$.

K.P15 Valeryi KURYAVYI

MAGNETIC PROPERTIES OF COMPOSITES OF METALS OXIDES OBTAINED IN A HIGH VOLTAGE PULSED DISCHARGE PLASMA AND BY SUBSEQUENT CALCINATION

In a high-voltage pulsed discharge plasma, samples consisting of metal oxides that make up the electrodes were synthesized. In the obtained samples, the degree of oxidation of the metals was changed by calcining the samples. Cu_2O, CuO, Cu_2O/CuO, Cu_2O/NiO, NiO/Cr_2NiO_4 were synthesized. The structure of the samples was studied by means of X-ray, SEM, IK, Raman, XPS. The magnetic susceptibility of the samples was measured and studied on a SQUID magnetometer.

K.P16 Sergey NAUMOV

EFFECT OF STRUCTURAL DEFECTS ON THE MAGNETIC ORDER IN A DOUBLE LAYERED COBALTITES $LnBaCo_{2-x}O_{5.5-d}$

The effect of structural defects in cobalt and oxygen sublattices on the magnetic properties of the $GdBaCo_{2-x}O_{5.5-d}$ and $EuBaCo_{2-x}O_{5.5-d}$ single crystals and polycrystalline samples were investigated in the temperature range 2 K < T < 650 K in magnetic fields $H \leq 90$ kOe.

K.P17 Samvel YEGIYAN

LOW ENERGY DYNAMICS OF SINGLE CRYSTALLINE M-TYPE BARIUM HEXAFERRITE DOPED WITH TITANIUM

By means of terahertz-infrared spectroscopy, we have studied polarization dependent broad-band dielectric response of titanium substituted M-type barium hexaferrites, $BaTi_xFe_{12-x}O_{19}$, in the frequency range from 4 to 8000 cm^{-1} and at temperatures from 5 to 300 K. Due to its multiferroic properties hexagonal ferrites are promising candidates for application in spintronics. Low-energy dynamics is determined by electronic transitions within the fine structure of Fe^{2+} and the relaxational processes.

K.P18 Asmaa AHMED

EFFECT OF AL SUBSTITUTION ON LOW-ENERGY ELECTRODYNAMICS OF BARIUM-LEAD M-TYPE HEXAGONAL FERRITES

We investigate the influence of Al doping on the dielectric response of single crystalline lead-substituted barium hexaferrites of M-type. The broadband spectra of complex refractive index of $Ba_{0.8}Pb_{0.2}Al_xFe_{12-x}O_{19}$ (where x = 1.2, 3, 3.3) obtained with use of Fourier-transform infrared spectroscopy and terahertz time-domain spectroscopy are studied in the temperature range from 4 to 300 K and at frequencies from 7 cm^{-1} up to 8000 cm^{-1}. The results of analysis are discussed in details.

K.P19 Lubov UDOD

SPIN STATE OF IRON IONS IN $Bi_2(Sn_{1-x}Fe_x)_2O_7$

The $Bi_2(Sn_{1-x}Fe_x)_2O_7$ (= 0.1, 0.2) compounds was synthesized by the solid-state reaction. The synthesized samples corresponded to the monoclinic *Pc* cell of the α-$Bi_2Sn_2O_7$ phase. According to magnetic measurements and Mössbauer spectroscopy, iron ions occupy octahedral positions. The distortion of the octahedra was found, that increases with increasing iron concentration. Iron ions are in the high-spin state.

K.P20 Alexey SHINKORENKO

AB INITIO INVESTIGATION OF PHYSICAL PROPERTIES AND PHASE DIAGRAM OF MAGNETIC TETRABORATE CRYSTALS $M^{2+}B_4O_7$

Theoretical study of physical properties of magnetic tetraborate compounds using the VASP software package.

K.P21 Nikita ANDRYUSHIN

FIRST-PRINCIPLES CALCULATIONS OF STRUCTURAL AND MAGNETIC PROPERTIES OF $CaFeTi_2O_6$ AND $CaMnTi_2O_6$

The first-principle calculations of structural and magnetic properties of double *A*-site ordered perovskite $CaFeTi_2O_6$ and $CaMnTi_2O_6$ are performed. In the work, the lattice dynamics and magnetic ordering in ground state were obtained for both crystals. Lattice dynamics calculation showed the favorableness of polar distortion of $CaMnTi_2O_6$. For $CaMnTi_2O_6$ the value of spontaneous polarization was estimated.

K.P22 Evgenii PETROV

IN-PLANE MAGNETIZED ANTIFERROMAGNETIC TOPOLOGICAL INSULATORS

In this work we propose an in-plane magnetized tetradymite-like antiferromagnetic topological insulators family: $MnBi_2Te_2Se_2$, $VBi_2Te_2Se_2$ and VBi_2Te_4. By means of ab initio calculations we study their crystal, magnetic and band structures. We predict these compounds to possess interlayer AFM ordering with easy axis lying within (0001) plane, and inverted band gap up to 330 meV.

K.P23 Alexey BADELIN

EFFECTS OF LONG STORAGE IN La-Sr MANGANITES WITH PARED DIVALENT AND QUADRIVALENT SUBSTITUENTS FOR MANGANESE

Changes of unit cell volume, magnetization, Curie point and metal-semiconductor transition temperature of ceramic manganites $La_{1-c}Sr_cMn_{0.90}Ni_{0.05}Ge_{0.05}O_3$ (= 0.15, 0.17, 0.19) during storage for 51 months in normal conditions are presented. The drift of magnetic characteristics is not more than 4%. Changes of electrical parameters are more significant. It was concluded that the ageing of considered manganites is related to oxidation processes and formation of microinhomogeneities.

K.P24 Mikhail UIMIN

TWO DIFFERENT TYPES OF FERROMAGNETIC STATE IN TiO_2-Co NANOPOWDERS

Magnetic properties of TiO_2-Co nanopowders were studied both in as prepared state and after heat treatments. The analysis of magnetization curves at temperatures from 2 to 900 K showed that 2 types of ferromagnetic phase can be realized. One phase is metallic cobalt with a typical temperature dependence of magnetization. The second magnetic phase is characterized by a completely different dependence $M(T)$ and high stability when heated in an oxidizing atmosphere.

K.P25 Oleg MATVEEV

CONCEPT OF USING COMPOSITE MULTIFERROIC STRUCTURE MAGNONIC CRYSTAL – FERROELECTRIC SLAB AS MEMORY UNIT

In the present work, it is proposed to use as a memory cell with random access a new type of memristor - a multiferroic wave memristor based on structure magnonic crystal-ferroelectric slab. Theoretical model of spin waves propagating in magnonic crystal-ferroelectric slab taking into account ferroelectric hysteresis is developed. Calculation of dispersion characteristics depending on FE polarization is presented.

K.P26 Sergei KLIMIN

PHONON ANOMALY IN Sm_2BaNiO_5

Optical spectroscopic study of mutiferroic Sm_2BaNiO_5 was performed. Anomalous temperature behavior of the lowest frequency phonon was detected. The correlations between phonon, electronic, and dielectric anomalies are discussed.

K.P27 Andrey NEMTSEV

AB INITIO STUDY OF INTERRELATION BETWEEN STRUCTURAL, MAGNETIC AND OPTICAL PROPERTIES OF $MnGa_2O_4$ AND $MnCo_2O_4$ SPINELS

The ab initio calculations of magnetic, electronic and optical properties of $MnGa_2O_4$ and $MnCo_2O_4$ spinels were performed within DFT-GGA approach. The total energies ground magnetic state, band structures and absorption coefficients were obtained and compared for $MnGa_2O_4$ and $MnCo_2O_4$ oxides in normal and inverse spinel structures.

K.P28 Nikolay ZAITSEV

SPIN–ORBIT SPLIT TWO-DIMENSIONAL STATES OF BiTeI/Au(111) INTERFACES

We present an ab initio study of interfaces formed by placing a single trilayer of BiTeI on the Au(111) surface. We consider two possible interfaces with the parallel and antiparallel orientation of the trilayer dipole moment with respect to the surface normal, i.e. Te-Bi-I/Au(111) and I-Bi-Te/Au(111).

K.P29 Yanxue CHEN

REVERSIBLE PHASE CONTROL OF STRONTIUM COBALTITE FILMS BY A FLEXIBLE SOLID-STATE ELECTROLYTE GATE

Electric-field modulation of the oxygen nonstoichiometry in strontium cobaltite has been realized using a flexible solid-state electrolyte at room temperature, which allow a reversible phase transition between brownmillerite antiferromagnetic insulating $SrCoO_{2.5}$ and perovskite ferromagnetic metallic $SrCoO_{3-\delta}$.

K.P30 Natalia MIKHASHENOK

MAGNETIC PROPERTIES AND CRYSTAL STRUCTURE $Mn_{1-x}Ni_xGeO_3$ SINGLE CRYSTAL

This study devoted to investigation of crystal structure and magnetic properties of $Mn_{1-x}Ni_xGeO_3$ with x = 0.05 grown by a flux method using the original technique. The crystal structure was determined on single crystal by X-ray diffraction method.Magnetic measurements were performed in the temperature range from 2 to 300 K and in magnetic fields up to 50 kOe. It is shown, the magnetic characteristics are sensitive even to minor impurity amounts.

K.P31 Veronika TITOVA

MAGNETOELECTRIC PROPERTIES OF $NdSc_3(BO_3)_4$

The $NdSc_3(BO_3)_4$ crystal was grown from the melt solution. The magnitude of the magnetoelectric effect in $NdSc_3(BO_3)_4$ depends not only on the size of the electronic structure of Sc^{3+} ions, but also on the conditions of heat treatment of the grown crystals.

K.P32 Sergei FILNOV

ANTIFERROMAGNETIC RARE EARTH-DOPED TOPOLOGICAL INSULATOR $Bi_{1.09}Gd_{0.06}Sb_{0.85}Te_3$

We have studied electronic and magnetic structure of the Gd-doped topological insulator $Bi_{1.09}Gd_{0.06}Sb_{0.85}Te_3$. Hybridization of the Dirac cone with impurity states of gadolinium is experimentally observed. Investigation of a magnetic structure has shown the presence of hysteresis loop at near 100 K region. Surface RKKY-like type of magnetism via topological surface states will be discussed as one of the possible explanation of the observed magnetic features.

K.P33 Filuza MAKSUTOVA

SOME ASPECTS OF THE FLEXOMAGNETOELECTRIC INTERACTION IN A UNIAXIAL FERROMAGNET IN A PLANAR MAGNETIC FIELD

We show that in-plane magnetic field H (longitudinal field) leads to a weakening of the flexomagnetoelectric effect: the maximum angle characterizing magnetization exit from the plane of the wall ϕm along with polarization decrease for all types of magnetic inhomogeneities.

K.P34 Aliona ZHIVULKO

SYNTHESIS AND MAGNETIC PROPERTIES OF $Mn_{1-x}Co_xTe$ SOLID SOLUTIONS

The purpose of the work is the synthesis of solid solutions of the MnTe–CoTe quasi-binary section, the study of their crystal structure and magnetic characteristics.

K.P35 Ilya KLIMOVSKIKH

EXPERIMENTAL VIEW OF ANTIFERROMAGNETIC TOPOLOGICAL INSULATORS

Recent prediction of the first antiferromagnetic topological insulator $MnBi_2Te_4$ serves it as the best known platform for quantum anomalous Hall and axion insulator states. Here we experimentally study $MnBi_2Te_4$ and related MnTe–Bi_2Te_3 compounds by means of angle- and spin-resolved photoemission spectroscopy, SQUID and XMCD magnetometry, and other techniques and demonstrate the peculiar magnetic ordering as well as the massive Dirac fermions predicted for novel topological phases.

K.P36 Lyudmila KVEGLIS

THE APPEARANCE OF FERROMAGNETISM IN BERYLLIUM CERAMICS

The problem is the unknown reason for the appearance of ferromagnetism in the group of nonmagnetic atoms: beryllium, titanium and oxygen. The aim of this work is to explain the mechanism of unique physical properties appearance of beryllium ceramics: high electrical conductivity and magnetization in the dielectric source material by modeling structural transformations at the nano-scale level.

K.P37 Dmitry ESTYUNIN

LASER INDUCED PHOTOEMISSION STUDY OF MAGNETICALY DOPED TOPOLOGICAL INSULATORS

By means angular resolved photoemission spectroscopy induced by laser light we measured with high energy and wave vector resolution the Dirac point band gap for the common compound of TIs doped with various magnetic elements of rare earth and transition metals.

K.P38 Daria KULIKOVA

DYNAMIC STUDY OF ELECTRIC FIELD-INDUCED BUBBLE DOMAIN NUCLEATION IN IRON GARNET FILMS

The electric field-induced generation of magnetic domains is of interest in the context of information and energy-saving technologies. This effect was shown to be pure magnetoelectric effect, but the role of the charge/discharge currents remained a matter of concern. We report the experimental results of the dynamic investigation of the domain nucleation and confirm that this process is induced by electric field rather than the pulses of magnetic field due to the charge/discharge currents.

K.P39 Alexander FREYDMAN

THE REVERSAL MAGNETOELECTRIC MEE-EFFECT IN THE $SmFe_3(BO_3)_4$ MULTIFERROIC IN DC AND AC ELECTRIC FIELDS

The inverse magnetoelectric effect in the $SmFe_3(BO_3)_4$ single-crystal sample in an applied electric field $E = e_0 + e\cos(\omega t)$ has been studied. According to the measurement data, the dc field e_0 significantly affects the MEE-effect first-harmonic amplitude: depending on the e_0 sign, these oscillations can be either amplified or suppressed. This offers an opportunity for controlling the magnetic moment oscillation amplitude at the applied electric field frequency, including the signal modulation.

Section N. Magnetic non-destructive testing

Poster area III.B

Chairpersons: Olga VASILENKO, Alexey STASHKOV

N.P1 Aleksandr KOROLEV

HIGH TEMPERATURE MAGNETIC PROPERTIES OF THE CHELYABINSK METEORITE

Studies of the magnetic properties of Chelyabinsk meteorite samples were carried out in a wide temperature range. The analysis of the obtained data shows that the meteorite contains a certain amount of metallic inclusions of the Fe–Ni type alloy and pure iron. Polymorphic transformations are not recorded in the meteoric iron.

N.P2 Iurii REPCHENKO

X-RAY MAGNETIC DICHROISM OF GdCo FILM STUDIED BY REFLECTIVITY WITH POLARIZATION SELECTION

The dichroic effect (“rotated” polarization) in the reflectivity from a magnetically ordered sample is experimentally studied at the station PHASE of the Kurchatov Synchrotron Radiation Source. The developed theory of reflectivity accounted for the magnetic contributions to the scattering amplitude predicts the appearance of a peak for the orthogonal (to the incident polarization) polarization of the reflected radiation near the critical angle of the total external reflection.

N.P3 Alexei KAPITANOV

DIAMAGNETIC PROPERTIES OF POLYACRYLIC ACID SOLUTIONS

Solutions of polyacrylic acid in dioxane-1.4 and tetrahydrofuran have been investigated. The phase transition were studied using the cloud point method. The magnetic moment measurement and the calculation of magnetic susceptibility of substances were performed using the magnetic complex.

N.P4 Hector GOMEZ

DIGITAL SIGNAL PROCESSING ANALYSIS OF BARKHAUSEN NOISE RESPONSE IN SOFT MAGNETIC AMORPHOUS RIBBONS

We present a digital signal processing and analysis in Barkhausen noise response to establish the experimental conditions, which ensure the repeatability of this response in soft magnetic amorphous ribbons with different magnetostriction. The sample was controlled by means of inductor sensor. We use a discrete approximation of multiple magnetic states and which is necessary within the same measurement process, because the magnetization in material involves linear and non-linear stages.

N.P5 Anna POVOLOTSKAYA

THE INFLUENCE OF ZERO-TO-TENSION CYCLIC LOADING ON MAGNETIC AND ACOUSCTIC PROPERTIES OF 08G2B HOT-ROLLED STEEL

The paper reports on the results of studying the effect of the number of zero-to-tension loading cycles, with an amplitude approximately corresponding to conventional yield strength, on the acoustic and magnetic parameters of the 08G2B hot-rolled steel. The parameters uniquely varying with the number of cycles have been determined, and this principally enables these parameters to be used for the development of nondestructive methods of testing fatigue degradation in the material of structures.

N.P6 Alexander PECHENKOV

ANALYTICAL FORMULAS FOR 3D FIELDS OF SOME UNIFORMLY MAGNETIZED PERMANENT MAGNETS FOR SPECIALIZED COMPUTER PROGRAMS

The algorithm of calculations of 3D fields of systems of permanent magnets is offered. The form of each magnet is a right prism, with section in the form of a rectangular triangle. Each magnet is magnetized uniformly. The formulas can be used in specialized computer programs for calculation of magnetic systems of devices. Also they can be used for solution of the inverse problem of estimation of uniformity of magnetization of permanent magnets.

THURSDAY, 12.09.2019

Section C. Low dimensional magnetism

Poster area III.A

Chairpersons: Sergey STRELTSOV, Vladislav KATAEV

C.P1 Valeriy PLESHCHEV

MAGNETIC STATE AND MAGNETIC HYSTERESIS IN THE MOLYBDENUM DISELENIDE INTERCALATED WITH CHROMIUM ATOMS

At temperatures above 150 K Cr_xMoSe_2 compounds with different chromium contents are in the paramagnetic state with positive values of the paramagnetic Curie temperature. With a decrease in temperature in these compounds, a transition to a ferromagnetic state occurs with a characteristic manifestation of hysteresis properties. The coercive field reaches values to 3 kOe at T = 2 K.

C.P2 Vladimir VAS'KOVSKIY

FEATURES OF SPONTANEOUS SPIN REORIENTATION IN AMORPHOUS FILMS OF THE Gd-Co SYSTEM

Spontaneous spin reorientation realized in amorphous Gd-Co films as a result of the competition between perpendicular magnetic anisotropy and shape anisotropy was investigated. It is shown that the reorientation occurs through the formation of a highly dispersed inhomogeneous magnetic structure of the "transcritical state" type. The phase diagram in composition–temperature coordinates was constructed. It defines the regions of existence of states with different nature of magnetic anisotropy.

C.P3 Zhavrail IBAEV

STUDY OF THE DECORATED SYSTEMS ON THE SQUARE LATTICE BY THE MONTE CARLO METHODS

The paper presents studies of the model of the decorated magnetic systems carried out on a square lattice. The study was carried out with the Monte Carlo methods based on the Wang-Landau algorithm. For this purpose, the square-shaped systems with periodic boundary conditions were simulated on a computer. The dimensions of the systems under study are L = 16, 32, 64, 128 and, accordingly, the effective number of the spins is N_eff = 192, 768, 3072, 12288.

C.P4 Marina MAMONOVA

INVESTIGATION OF THE MAGNETIC AND ADSORPTION PROPERTIES OF A Fe_xNi_{1-x} MONOLAYER FILM ON NONMAGNETIC METAL SUBSTRATES

In this paper, the adsorption energy and spatial distribution of relative magnetization at activated adsorption of Fe_xNi_{1-x} monolayer film on nonmagnetic metal substrates calculated by the spin-density functional method, depending on the concentration of the alloy components and the coating parameter. The temperature effects of mixing of adsorbate and substrate atoms and the inhomogeneous distribution of magnetization are taken into account.

C.P5 Rushana EREMINA

MAGNETIC PROPERTIES OF COPPER–BASED LUDWIGITES

C.P6 Igor YANILKIN

MAGNETIC PROPERTIES OF $Pd_{1-x}Fe_x$ FILMS AND HETEROSTRUCTURES WITH THEM

We present synthesis and studies of dilute $Pd_{1-x}Fe_x$ thin films and heterostructures with them prepared by molecular-beam epitaxy and magnetron sputtering. Magnetic anisotropy, exchange bias and coupling, magnetic proximity were investigated for different concentrations of iron in the alloy, utilizing ferromagnetic resonance spectroscopy and vibrating sample magnetometry. Unconventional exchange bias, exchange spring, interlayer coupling and proximity effects have been observed and discussed.

C.P7 Anna KHARLAMOVA

THE INFLUENCE OF THE INTERLAYER ON THE MAGNETIC AND STRUCTURAL PROPERTIES OF THREE-LAYER SYSTEMS

Analysis of the composition and thickness of Si, Bi, Mo, PDP (poly diphenylene phthalide) nonmagnetic intermediate layers on the magnetic and structural properties of Co/Si/Co, Co/Bi/Co, Co/Mo/Co and Fe/PDP/Fe three-layer thin-film systems and also comparison the mechanisms of exchange interaction between FM layers through nonmagnetic layers were performed.

C.P8 Denis STARICHENKO

SINGLE-MOLECULE MAGNET WITH PLANAR POLYCUBANE [Ni(II)-O] CORE

We report a planar single-molecule ferrimagnet with Ni18 metal-oxygen core.

C.P9 Aleksandr GORKOVENKO

MAGNETIC PROPERTIES OF GdCo-Al_2O_3 COMPOSITE FILMS

In this work we studied the magnetic properties of GdCo-Al_2O_3 composite films. The films were obtained with simultaneous magnetron sputtering of the Gd, Co, and Al_2O_3 targets. Magnetic properties were measured by VSM. It was found that the metal phase at an Al_2O_3 concentration of about 50% forms in clusters. Their composition is quite close to that expected during deposition. It means that Gd practically does not oxidize and forms a stable compound with Co.

C.P10 Marina MAKAROVA

NEUTRON STUDY OF MAGNETIC ORDERING OF RARE EARTH/TRANSITION METAL MULTILAYERS

The magnetic properties of Fe/Pd/Gd and Dy/Co superlattices were studied. The measurements are performed using polarized neutron reflectometry. By neutron reflectometry we found rich phase diagram of Fe/Pd/Gd,Dy/Co heterostructures which arising due to the competition of exchange coupling, magneto crystalline anisotropy and Zeeman energy.

C.P11 Taa TAAEV

HARD/SOFT MAGNETIC BILAYER

We present a model of hard/soft magnetic bilayer for the Monte Carlo investigation under the external magnetic field. The influence of the exchange intralayer and interlayer interaction constants on the magnetic bilayer thermodynamic properties and magnetization reversal processes are explored for the first time. Behavior of the magnetic bilayer under the external magnetic field is shown to agree with theoretical predictions well enough.

C.P12 Roman YAROSLAVTSEV

ION REDUCTION IN IRON OXIDE AND OXYHYDROXIDE NANOPARTICLES DURING ULTRASONIC TREATMENT

The effect of ultrasonic treatment of iron oxide and iron oxyhydroxide nanoparticles (ferrihydrite nanoparticles synthesized by Klebsiella oxytoca microorganisms, ferrihydrite nanoparticles synthesized by a chemical method and hematite nanoparticles) is studied. The formation of the α-Fe metal phase from nanoparticles of iron oxides and iron oxyhydroxides was detected. The metal phase is formed as a result of the reduction of iron ions during cavitation treatment.

C.P13 Roman YAROSLAVTSEV

SYNTHESIS AND CHARACTERIZATION OF PLATE-LIKE MAGNETITE NANOPARTICLES

Square-plated magnetite nanocrystals with a high aspect ratio are prepared by the co-precipitation from a solution in the presence of arabinogalactan. The magnetic anisotropy constant of particles is several times higher than the constant of spherical magnetite particles, which leads to increased hysteresis properties for specific volume of the particle.

C.P14 Ruslan IVANTSOV

PREPARATION, PHASE EVOLUTION, AND MAGNETIC PROPERTIES OF LANTHANUM MANGANITE PEROVSKITE POWDERS SYNTHESIZED BY SOLID-STATE REACTION

Magnetization temperature dependences, magnetic circular dichroism and diffuse reflectance spectra were investigated for $La_{1-x}Sr_xMnO_3$ powder samples fabricated with the solid-state reaction method using different thermal regimes and x-values. Despite the same composition of raw materials (at x = 0.175) a mixture of many magnetic phases occurred. An increase of the synthesis temperature or duration leads to formation of two predominant magnetic phases with Curie temperature of about 250 and 360 K.

C.P15 Sergei ANISIMOV

TEMPERATURE DEPENDENCE OF THE INTERPHASE INTERACTION ENERGY OF CORE/SHELL NANOPARTICLES

We consider the interface between the core and the shell of the core/shell nanoparticles as a set of two adjacent monolayers (the shell and the core) with average values of the magnetic moments of atoms in the layers M1(T) and M2(T), respectively. The calculation of M1 and M2, carried out in the approximation of the method of random interaction fields, made it possible to approximate the temperature dependence of the interfacial exchange interaction constant using the exponential law.

C.P16 Egor KUDYUKOV

MAGNETIC ANISOTROPY AND MAGNETOELASTIC PROPERTIES OF $Fe_{10}Ni_{90}$ FILMS

This work is devoted to studying of the role of the substrate and buffer layers (Ta or ferroelectric PVDF) in the formation of magnetic and magnetoelastic properties of $Fe_{10}Ni_{90}$ films.

C.P17 Mikhail MOSKALEV

THICKNESS-DEPENDENT TRAINING EFFECT IN EXCHANGE-BIASED NiMn/FeNi THIN FILMS

Training effect of the exchange bias in magnetron-sputtered NiMn/FeNi thin films has been studied. Magnetic properties have been measured via Kerr-microscopy and SQUID-magnetometry. The NiMn layer exhibits the antiferromagnetic ordering, which leads to the shift of the loop of the FeNi layer. Both the trainig effect and exchange bias depend strongly on the thickness of the antiferromagnet. Information on the interface uncompensated spins and the antiferromagnet's anisotropy was obtained.

C.P18 Sergey KOMOGORTSEV

MAGNETIZATION CURVES OF FERROMAGNETIC MICROTUBES

The Co(P) tubes in the cylindrical pores of the polycarbonate membrane demonstrate magnetic behavior resemble magnetic film and magnetic wire simultaneously. New features due to topology of this element are discussed also.

C.P19 Ivan YAKOVLEV

THE MAGNETIC ANISOTROPY OF POLYCRYSTALLINE Fe_3Si SYNTHESIZED AT MAGNETIC FIELD BY MBE

It is studied the magnetic anisotropy of Fe_3Si films obtained on Si(001) and Si(111) substrates with a SiO_2 oxide layer, as well as on glass substrates with simultaneous deposition of Si and Fe. Samples were synthesized at an external magnetic field and without one. The polycrystalline Fe_3Si films on were formed. It is found that deposition at external magnetic field can increase the uniaxial magnetic anisotropy for the Fe_3Si film no less than two times.

C.P20 Oksana LI

MAGNETIC BEHAVIOR OF NANOCRYSTALLINE MAGNETIC FILM IN A ROTATING FIELD

We study magnetization of a disc-shaped element in a rotating magnetic field using micromagnetic simulation. The sample with 2 μm diameter and 10 nm thickness was divided into 10 nm cells with randomly oriented easy axis. The effect of dipole and exchange interaction is investigated. The angular dependences of the torque acting on the element are non-periodic. We explain this behavior by the entropy maximization in the magnetic subsystem of the element when the external field is rotated.

C.P21 Alexander KOLESNIKOV

MAGNETIC PROPERTIES OF EXCHANGE BIASED Pt/Co/NiO FILMS

We studied the effect of composition and deposition parameters on the values of induced magnetic anisotropy and exchange bias field for both in-plane and out-of-plane anisotropy cases. Exchange bias was induced by applied magnetic field during the deposition for in-plane and out-of-plane geometries. Inclined magnetization was observed in films with exchange field orthogonal to easy axis of magnetization.

C.P22 Ivan POPOV

NON-EQUILIBRIUM VORTEX ANNEALING OF STRUCTURAL DISORDER IN THE CRITICAL RELAXATION OF DILUTED TWO-DIMENSIONAL XY-MODEL

This work is devoted to the study of the non-equilibrium critical aggregation of structural disorder by vortices in a two-dimensional XY-model in the process of the non-equilibrium vortex critical relaxation of the system. The dynamic dependences of the geometric and dimensional characteristics of defect clusters and coherent structures, stripes and clumps, arising in the process of non-equilibrium critical relaxation have been obtained and studied.

C.P23 Vladislav FLYAGIN

MAGNETIC PROPERTIES OF THE MOLIBDENIUM DISULFIDE, INTERCALATED OF THE IRON AND CHROMIUM ATOMS

A comparative analysis of the magnetic properties of compounds has been carried out. Cr_xMoSe and Fe_xMoS_2 with different concentrations of intercalated atoms. In the Fe_xMoS_2 system, a maximum at T = 150 K was found on the temperature dependences of the susceptibility. Together with the negative values of the paramagnetic Curie temperature, we can assume the formation of antiferromagnetic ordering in iron-containing compounds.

C.P24 Natalya SHEPETA

MAGNETIC PROPERTIES OF COMPOSITION MODULATED MATERIALS WITH DIFFERENT SPATIAL DISTRIBUTION OF NANOGRAIN BASED ON ELECTROLESS DEPOSITION OF 3d METAL ALLOYS

This work focuses on the comparison between the magnetic properties of materials with different spatial distribution of nanograin, such as composite particles, multisegmented and gradient nanostructured rodsand multilayer films. Among the most important material characteristics are the values of anisotropy and saturation field. Magnetic anisotropy of composition modulated materials in comparison with that for homogeneous in composition samples was the subject of this report.

C.P25 Anna POPOVA

THE DIMENSIONAL CROSSOVER IN CRITICAL BEHAVIOR OF LAYERED XY-MODEL

The dimensional crossover in the equilibrium and non-equilibrium critical and low-temperature properties of the pure and site-diluted disordered XY-film was studied. Increasing the XY-film thickness leads to a gradual transition from the Berezinskii-Kosterlitz-Thouless phase transition in the two-dimensional XY-model to the ferromagnetic-paramagnetic phase transition in the three-dimensional XY-model.

C.P26 Olga ADANAKOVA

EFFECT OF TEMPERATURE ON THE EXCHANGE BIAS IN FeMn/X/$Fe_{20}Ni_{80}$ (X = Ta, Gd) FILMS

The influence of Ta and Gd spacers on the exchange bias in $Fe_{50}Mn_{50}/Fe_{20}Ni_{80}$ multilayers at the temperature range of 5–350 K was investigated.

C.P27 Konstantin BALYMOV

MAGNETISM OF AMORPHOUS Dy-Tb-Co-TYPE FILMS

This research is devoted to the study of the magnetic properties of amorphous Tb-Co, Dy-Co and Tb-Dy-Co films in a wide range of compositions and temperatures.

C.P28 Ekaterina KOZLYAKOVA

MAGNETIC PROPERTIES OF NOVEL FERRIMAGNETIC ALTERNATING SPIN CHAIN COMPOUND $Fe[(Te_{1.5}Se_{0.5})O_5]Cl$

Systems with non–collinear magnetic structures are a rich source for interesting physical phenomena. The formation of non-collinear magnetic ground state is necessary for breaking the inversion symmetry, which may cause to II-type multiferroelectricity. We have investigated a magnetic properties of novel compound $Fe[(Te_{1.5}Se_{0.5})O_5]Cl$. The results indicate antiferromagnetic ordering but with small spontaneous magnetic moment due to spin canting, so in total can be classified as ferrimagnet.

C.P29 Sergey POPKOV

SIZE AND SURFACE EFFECTS IN NiO NANOPARTICLES: RESULTS OF STUDIES IN STRONG PULSE MAGNETIC FIELDS

The magnetic properties of a series of samples formed by nickel oxide nanoparticles with averages sizes from 23 to 4.5 nm have been investigated in strong magnetic fields. The contribution corresponding to the ferromagnetic subsystem forming in AFM NiO nanoparticles was selected. The fraction of uncompensated spins increases with a decrease in the nanoparticle size from 0.04% for 23 nm particles to 2.4% for 4.5 nm particles.

C.P30 Aleksandr KOBYAKOV

THE INFLUENCE OF THE SEMICONDUCTOR LAYER ON THE MAGNETIC PROPERTIES IN A THREE-LAYER STRUCTURE CoNi/Si/FeNi

Negative and positive displacement of hysteresis loops in the film structures CoNi/Si/FeNi was found. The effect depends on the temperature and thickness of silicon.

C.P31 Gennady PATRIN

MAGNETIC PROPERTIES OF Fe-Bi FILM STRUCTURES

The results of experimental studies of the magnetic and resonance properties of film structures in the Fe-Bi system are presented. It was found that the interface anisotropy depends on the sequence of deposition of the magnetic and nonmagnetic layers, and the effect is more pronounced for Bi/Fe films. The effect of exchange bias was also found, the value of which depends on the thickness of the semi-metallic bismuth layer.

C.P32 Igor PERUNOV

MAGNETIC ANISOTROPY OF Fe, FeCo AND FeNi NANOWIRES AND CONTINUOUS LAYERS

We synthesized arrays of magnetic nanowires made of Fe, Ni and Co and investigated their properties. All the samples were found to be magnetically ordered and to have a spontaneous preferred orientation of the domains magnetic moments along the wire length formed without application of an external magnetic field. We proposed a mechanism for the formation of such “magnetically textured” state and revealed that magnetic properties of the nanowires and continuous layers are different.

C.P33 Dmitry PEROV

MICROWAVE REFRACTION COEFFICIENT IN NANOCOMPOSITES AND NANOSTRUCTURES IN MAGNETIC FIELD

The measurements of transmission and refraction coefficients in magnetic field have been performed for the nanocomposite containing particles of metallic cobalt and effective magnetic permeability has been obtained. It has been shown that electromagnetic properties of this metamaterial are quite different on macro- and microscales. The nanocomposite is proved to be a material with near-to-zero refraction coefficient on submicron scale in the millimeter waveband.

C.P34 Yaroslav SHIYAN

MAGNETIC AND RESONANCE PROPERTIES OF EXCHANGE SPRING MULTILAYERS $[(CoP)_{soft}/NiP/(CoP)_{hard}]_n$

The magnetic and resonance properties of $[(CoP)_{soft}/NiP/(CoP)_{hard}]_n$ multilayer films were studied further. The interlayer interaction depends on the number of layers in the structure, whereas magnetically hard layers subsystem seems to be divided into two skewed sublattices.

C.P35 Valery VALEYEV

THE KONDO EFFECT IN 2D ELECTRON GAS OF MAGNETICALLY UNDOPED AlGaN/GaN HIGH-ELECTRON-MOBILITY TRANSISTOR HETEROSTRUCTURES

Unusual observations of Kondo effect in 2D electron gas (2DEG) of magnetically undoped AlGaN/GaN high-electron-mobility transistor heterostructures are reported. The temperature-dependent resistivity data exhibited an upturn below 120 K. Negative low-temperature magnetoresistance in the magnetic field range of ± 4 T, applied perpendicular to the 2DEG plane, with a magnitude of order of 1% was detected. The data were analyzed in the frame of the *n*-channel Kondo model for d^0-magnetic materials.

C.P36 Vadim BORZILOV

MONTE CARLO MODELING OF THE CRITICAL PROPERTIES OF MAGNETIC MULTILAYER STRUCTURE DESCRIBED BY THE ANISOTROPIC HEISENBERG MODEL

The effects of hysteresis in multilayer structures in an external field were investigated in this work. The results presented in this work indicates the importance of anisotropy effects and interlayer interaction especially for the processes of fast magnetic states switching in multilayer magnetic structures.

C.P37 Anatoly ANOKHIN

HETEROMETALLIC SINGLE-MOLECULE MAGNET WITH DICUBANE CORE $Me^{II}_2Fe^{III}_2O_6$, Me = Co, Ni

We report experimental and theoretical study of the thetranuclear coordination complex with exchange-coupled spin coor $Me_2Fe_2O_6$, *Me*=Co,Ni.

C.P38 Dmitry ZAGORSKIY

MAGNETIC NANOWIRES: TEMPLATE SYNTHESIS, STRUCTURE AND PROPERTIES

Magnetic nanowires (NWs) were obtained by matrix synthesis technique, using etched track membranes as porous templates. Two types of nanowires were obtained – homogeneous alloys (Fe-Ni, Fe-Co and Fe-Ni) and heterogeneous layered NWs (Ni/Cu and Co/Cu) were electrodeposited into the pores of PET membrane. Galvanic process was investigated. Topography and crystal structure were estimated by SEM and X-ray methods. Magnetic properties of samples were investigated by Magnetometery, Mossbauer and MFM.

C.P39 Mikhail RAUTSKII

MAGNETIC PROPERTIES OF α-$FeSi_2$ IRON SILICIDE NANOCRYSTAL WITH DIFFERENT PREFERRED ORIENTATION

We observed that α-$FeSi_2$/Si nanostructures with a preferred orientation of α(001)/Si(100) contain paramagnetic and ferromagnetic components, while α-$FeSi_2$ nanocrystals are almost completely oriented on the α(111) plane, detect only paramagnetic ordering in a magnetic field up to 6 T.

C.P40 Dmitriy CHERKASOV

TEMPLATE SYNTHESIS OF DIFFERENT METAL NANOWIRES WITH APPLYING OF MAGNETIC FIELD

New type of magnetic nanomaterial — "layered" and "alloy" nanowires (NWs) seems promising due to variable magnetic properties and wide range of potential applications: sensors, nanomagnets, magnetic field (MF) measurements, etc. The method of obtaining NWs is a galvanic deposition.

C.P41 Dmitrii TAYURSKII

VIBRATIONAL PROPERTIES OF THE ANTIFERROMAGNETIC CHAIN TERNARY SULPHIDE $KFeS_2$

The ternary iron sulphide $KFeS_2$ consists of chains of edge-sharing [FeS_4] tetrahedra forming a quasi-one-dimensional spin-system. Single crystals exhibit collinear antiferromagnetic order with strongly reduced moments below T_N. The small anomaly in *C(T)* and the corresponding low value of entropy at T_N indicate a significant spin reduction and the existence of AFM fluctuations even far above T_N.

C.P42 Sergei BUDKO

CALCULATION OF THE EXCHANGE INTERACTION INTEGRALS FOR $Co_{1-x}Ni_x$ ALLOY BY KORRING-COHN-ROSTOKER METHOD

In this paper, in the framework of first-principle calculations using the VASP and SPR-KKR software systems, the magnetic properties of a cobalt-nickel alloy are investigated depending on the alloy components concentration. The lattice constants and magnetic moments of Ni and Co atoms in the alloy were calculated. The calculation of the exchange interaction integrals for the closest and next closest neighbors is carried out.

C.P43 Igor DANILOVICH

ALTERNATING SPIN CHAIN COMPOUND $Cu_2BO(OH)_2(OH)_3$

For decades, there has been a flourish of interest in onedimensional (1D) quantum antiferromagnets (AFM), as they often provide unique opportunities to study the interplay between the charge, orbital, spin, and lattice degrees of freedom. Here we present synthesis, thermodynamic and resonance properties of novel spin-1/2 chain compound $Cu_2BO(OH)_2(OH)_3$.

C.P44 Marina MAKAROVA

THE IMAGING OF HIGH DENSITY MAGNETIC RECORDING MEDIA USING ALTERNATING MAGNETIC FORCE MICROSCOPY

Recently developed Alternating Magnetic Force Microscopy (A-MFM) method has been applied to the imaging of perpendicular magnetic recording media with the 500-1600 kfci recording densities. Fe-Co-B, Co-Zr-Nb and Ni-Zr amorphous soft magnetic tip coatings of 6 nm and thicker were used. Effect of composition on imaging performance and stability in ambient conditions was studied. The model of inverse magnetostriction effect on imaging performance was proposed.

C.P45 Yoon Seok OH

UNCONVENTIONAL POWER LAW BEHAVIOR IN THREE-DIMENSIONAL ANTIFERROMAGNET OF S=1 SPIN CHAIN

Near the phase transition, the order parameters are developed as follow a power law with specific exponents called critical exponents.

Section D. Domain walls, vortices and skyrmions

Poster area I.A

Chairperson: Michael BORICH

D.P1 Vitaly ORLOV

FEATURES OF MOTION OF INTERACTING VORTEX DOMAIN WALLS IN NANOSTRIPES

D.P2 Ildus SHARAFULLIN

DZYALOSHINSKII-MORIYA INTERACTION IN MULTIFERROIC SUPERLATTICES: SPIN WAVES AND SCYRMIONS

We consider in this work a superlattice composed of alternate magnetic films and ferroelectric films. The aim of this work is to propose a new model for the coupling between the magnetic film and the ferroelectric film by introducing a DM-like interaction. The ground state shows uniform non collinear spin configurations in zero field and skyrmions in an applied magnetic field. Monte Carlo simulation has been used to study the phase transition occurring in the superlattice with applied field.

D.P3 Ivan IZMOZHEROV

HYSTERESIS FEATURES IN FILMS WITH PERPENDICULAR MAGNETIC ANISOTROPY CONTAINING BLOCH LINES

Transformations of magnetic domain structures in films with PMA in uniform constant magnetic field and with quality factor $Q<1$ are studied using three-dimensional micromagnetic simulations. It is shown, that global phase transitions between labyrinth structures, strong stripe domains and bubble domains are accompanied by local processes connected with vertical bloch lines, containing Bloch points.

D.P4 Ivan SHASHKOV

TEMPERATURE EFFECT ON THE DOMAIN WALL DYNAMICS IN A GdFeCo/IrMn BILAYER

In this work, we investigate statistics of Barkhausen jumps at different temperatures in GdFeCo/IrMn heterostructures. The exchange bias occur in this material with temperature decrease which can modify domain wall dynamics.

D.P5 Aleksei KOZLOV

DZYALOSHINSKII-MORIYA INTERACTION IN SYMMETRIC EPITAXIAL $[Co/Pd(111)]_n$ SUPERLATTICES WITH DIFFERENT NUMBERS OF Co/Pd BILAYERS

We report on evidence of strong DMI in symmetric epitaxial $[Co/Pd]_n$ superlattices with high perpendicular magnetic anisotropy. The structural and magnetic properties of epitaxial $[Co/Pd]_n$ superlattices were investigated dependent on the number of bilayers. Based on comparison of the periodicity of experimentally obtained demagnetized patterns and simulated magnetic structures, a strong increase of the effective DMI constant with increase of the period n of $[Co/Pd]_n$ structures is established.

D.P6 Evgenii EKOMASOV

DYNAMICS OF COUPLED MAGNETIC VORTICES IN TRILAYER CONDUCTING NANOCYLINDER

Solving numerically the generalized Landau–Lifshitz equation, we have carried out the micromagnetic investigation of the dynamics of two dipole-coupled magnetic vortices in a trilayer nanocolumn under the action of the external magnetic field directed perpendicular to the sample plane and spin-polarized electric field. The possible existence of different regimes of vortex motion, depending on the polarized current, is demonstrated.

D.P7 Roman KUDRYAVTSEV

ONE-DIMENSIONAL DYNAMICS OF MAGNETIC INHOMOGENEITIES IN A THREE- AND FIVE-LAYER FERROMAGNETIC STRUCTURE WITH DIFFERENT VALUES OF THE MAGNETIC PARAMETERS

The method of collective variables yielded a system of one-dimensional differential equations for the kink dynamics of the sine-Gordon equation and the oscillations of the impurity modes in a model with an arbitrary number of different point impurities at an arbitrary distance from each other in the presence of an external force and inhomogeneous dissipation. The dependences of the kink center coordinates and the amplitudes of the impurity modes in special cases are constructed.

D.P8 Mikhail LYSOV

UNIDIRECTIONAL MOTION OF MAGNETIC DOMAIN WALLS: THE EXPERIMENT AND NUMERICAL SIMULATION

The results of study of unidirectional motion of domain walls (DW) in rare earth iron garnet single-crystal [111] plate under the influence of periodic unipolar and bipolar magnetic field pulses applied perpendicular to the sample plane at repetition frequencies from 0.05 to 500 Hz are presented. It is established both experimentally and by numerical simulations that unidirectional motion of DW under the influence of bipolar magnetic field pulses can be a mechanism of DW drift.

D.P9 Dmitry MEKHONOSHIN

MICROMAGNETIC MODELING OF THE DOMAIN STRUCTURE DURING SELF-ORGANIZATION IN THIN FERROMAGNETIC FILMS

Numerical modeling of the domain pattern evolution in thin ferromagnetic film with perpendicular anisotropy in alternating magnetic film was performed within a framework of 2D scalar field model. The processes of the nucleation of spiral domains were revealed.

D.P10 Vladimir ZVEREV

DYNAMIC TOPOLOGICAL 3D STRUCTURES IN MOVING DOMAIN WALLS IN PERMALLOY FILMS OF VARIOUS THICKNESSES

D.P11 Robert VAKHITOV

BEHAVIOUR OF VORTEX-LIKE INHOMOGENEITIES IN AN INHOMOGENEOUS UNIAXIAL FERROMAGNETIC FILM IN A MAGNETIC FIELD

The paper investigates the influence of a magnetic field on the structure and properties of magnetic formations on the defects of the “potential well” type in uniaxial ferromagnetic films. It has been shown that in a longitudinal magnetic field their structures transform in 2-3 stages, this transformation being dependent on the core polarity. A diagram of their stable conditions has been constructed and the critical fields have been identified at which their restructuring takes place.

D.P12 Oleg TRUSHIN

ENERGETICS OF DOMAIN WALL IN MAGNETIC NANOWIRE

Micromagnetic modeling is used to study the energetics of magnetic switching of single-layer permalloy nanowire. The energy landscape of the system is studied using Nudged Elastic Band method. Dependence of energy barrier for DW nucleation on the nanowire geometry has been studied. It has been shown that presence of rectangular shape notch on the nanowire long side leads to the appearance of local minimum on the energy profile, which corresponds to DW pinning.

D.P13 Irina ORLOVA

DYNAMICS OF MAGNETIZATION IN AN ARRAY OF THREE-LAYER NANODISCS

The paper studies associated motion of magnetic vortices in a triple-layer FM/NM/FM disc array. The frequencies of magnetic vortex resonant motion have been calculated analytically and resonant curves for the arrays with different alternation of magnetic vortex polarity and chirality have been constructed. The effect of interaction between magnetic moments of the vortex cores on splitting of magnetic resonance frequencies is discussed.

D.P14 Irina KALENTYEVA

CHANGING THE MAGNETIC PROPERTIES OF CoPt ALLOY BY ION IRRADIATION

The effect of ion irradiation on the magnetic properties of CoPt alloy made by the method of electron beam evaporation is investigated. It has been established that with an increase in the He^+ ion fluence from 1×10^{13} to 1×10^{16} cm^{-2}, a decrease in the coercive field and an increase in the planar component of the axis of easy magnetization are observed. Using magnetic force microscopy it was shown that with ion fluence 3×10^{14} cm^{-2} the formation magnetic skyrmions is observed in the CoPt layer.

D.P15 Mariia POTKINA

CALCULATION OF MAGNETIC SKYRMIONS LIFETIMES IN TILTED MAGNETIC FIELD

In this report we consider the application of TST to the skyrmion system with tilted magnetic field. We show that nonmonotonic dependence of stability (lifetimes) of skyrmions on the tilting angle of the field θ and on the value of magnetic field h takes place already in 2D system and even without dipole interaction. It is in agreement with recent experimental observation of enhanced skyrmions stability in tilted magnetic field.

D.P16 Pavel ABAKUMOV

RAMAN IMAGING OF MAGNETIC STRUCTURES

The fine magnetic structure of the laminar yttrium orthoferrite ($YFeO_3$) was imaged by Raman spectroscopy method. For the first time the theoretically predicted zero magnetization region was observed in the Bloch wall structure.

Section E. Magnetotransport, magnetooptics and magnetophotonics

Poster area I.B

Chairpersons: Andrey TELEGIN, Vladimir BESSONOV

E.P1 Olga MAXIMOVA

$Fe/SiO_2/Si$ THIN FILMS STUDY BY MEANS OF IN SITU MAGNETO-ELLIPSOMETRY AND DFT

The work demonstrates the application of in situ spectral magneto-ellipsometry for studying layered structures with a ferromagnetic layer. The way of data processing, developed and discussed in the previous work, is used to calculate all elements of the dielectric permittivity tensor of Fe. These findings are compared to DFT calculations (this work) and literature experimental data for iron. The agreement is good enough, which justifies the possibility of the proposed method use.

E.P2 Valerii SOKOLOV

MAGNETIC CIRCULAR DICHROISM OF $^5I_8 \longrightarrow {}^5F_5$ TRANSITION IN $HoAl_3(BO_3)_4$ AND $HoFe_3(BO_3)_4$ CRYSTALS

The work is devoted to the comparative study of magnetic circular dichroism (MCD) and absorption spectra of $^5I_8 \longrightarrow {}^5F_5$ transition in Ho^{3+} ion in crystals with different local symmetry. The absorption spectra were decomposed into the Lorenz shape components and their intensities were determined. The MCD spectra permitted us to measure the Zeeman splitting and to determine changes of the Landé factors along the C_3 axis of the crystals.

E.P3 Aleksandr NOSOV

MAGNETIC PROPERTIES OF $YFeO_3$ THIN FILMS PREPARED BY MAGNETRON SPUTTERING

Magnetic properties of $YFeO_3$ thin films obtained by magnetron sputtering at the surface of r-Al_2O_3 substrates are analyzed.

E.P4 Vladimir IVANOV

FINEMET FILMS FOR VISUALIZATION OF INHOMOGENEOUS MAGNETIC FIELDS

We have shown that Finemet films can be used to visualize inhomogeneous magnetic fields. They have low coercive force and insignificant anisotropy in the plane.

E.P5 Aleksander MALAKHOVSKII

MAGNETIC LINEAR DICHROISM OF $^5I_8 \longrightarrow {}^5F_3$ TRANSITION IN $HoFe_3(BO_3)_4$ CRYSTAL

We present the study of magnetic linear dichroism (MLD) spectra of the optical transition OF $^5I_8 \longrightarrow {}^5F_3$ of Ho^{3+} ion in $HoFe_3(BO_3)_4$ crystal as a function of magnetic field 0-65 kOe at T=2 K. The MLD revealed strong anisotropy depending on orientation of magnetic field in the basal plane of the trigonal crystal. The anisotropy is different for different transitions in the studied manifold, that is, the MLD and its anisotropy are due to the excited states.

E.P6 Elena SHREDER

OPTICAL PROPERTIES AND ELECTRONIC STRUCTURE OF FERROMAGNETIC Co-BASED HEUSLER ALLOYS

The experimental and theoretical study of electronic structure of Co_2NiAl, Co_2FeAl, Co_2NiGa, Co_2FeGa Heusler alloys is presented.

E.P7 Valentina BESSONOVA

PECULIARITIES OF MAGNETO-INFRARED TRANSPARENCY OF NANOSTRUCTURED MANGANITE FILMS

The anisotropy of optical properties in films $La_{1-x}Ba_xMnO_3$ with a variant structure is considered. The effect of colossal magnetoresistance is observed near the Curie temperature. However, at low temperatures the effect of tunneling of spin-polarized charge carriers through the intergrain boundaries is observed, due to the formation of structural boundaries in the films.

E.P8 Timur FADEEV

HADFIELD STEEL — A MATERIAL WITH THERMOELECTRIC PROPERTIES

Hadfield steel ($Fe_{86}Mn_{13}C$ alloy) works as an alternative material for a thermoelectric energy converter. Unlike well-known semiconductor materials, it does not have the following disadvantages: •Low efficiency (up to 18 %); •Complicated and expensive technology; •Price (from 300 to 600 and more than $/kg); •Toxicity; •Loss of properties under cosmic radiation. The work is devoted to the study of the magnetic and electrical properties of thin-film samples of Hadfield steel.

E.P9 Anna KHUTIEVA

LATERAL SPIN-WAVE TRANSPORT AND SUPERDIRECTED BEAM FORMATION IN THE IN-PLANE MAGNETIZED MAGNONIC CRYSTAL

This paper presents the results of a theoretical and experimental study of the features of the propagation of spin waves in a magnetized magnonically crystalline structure based on an YIG film. The results of the calculations are in satisfactory agreement with the experimentally measured energy distribution of the spin-wave beam in the ferrite film.

E.P10 Oxana IVANOVA

COMPARATIVE STUDY OF THE MAGNETO-OPTICAL SPECTRA OF WEAK FERROMAGNETS $FeBO_3$ AND α-Fe_2O_3

A study of the optical and magneto-optical spectra of the weak ferromagnets — α-Fe_2O_3, nanoparticles and bulk single crystal, and $FeBO_3$ single crystal containing the same magnetic ions Fe^{3+} occupying only octahedral positions was performed. All maxima in the $FeBO_3$ absorption and magneto-optical spectra are due to the one-ion *d–d* transitions, while some features in the α-Fe_2O_3 spectra can be associated with an excitation of the exchange coupled neighboring iron ions.

E.P11 Nazar LUGOVSKOY

SUSCEPTIBILITY AND FMR IN EPITAXIAL GARNET FERRITE FILMS FOR EDDY CURRENT MAGNETO-OPTICAL DEFECTOSCOPY

The field and angular dependences of susceptibility and FMR in epitaxial films of garnet ferrite and their influence on eddy current magneto-optical defectoscopy are considered.

E.P12 Ivan TARASOV

MAGNETO-OPTICAL ACTIVITY OF Fe_3Si-Au BASED MAGNETOPLASMONIC NANOSTRUCTURES

In this work, we aim to research into the magneto-optical (MO) activity of ferromagnetic Fe_3Si iron silicide thin films coupled with gold layers. Patterned dot and antidot nanostructures are also under investigation. The utilization of Fe_3Si compound instead of pure ferromagnetic metals gives us an opportunity to alter intrinsic optical and MO properties of ferromagnetic metal through the chemical composition and chemical order.

E.P13 Elena GAN'SHINA

MAGNETOOPTICAL SPECTROSCOPY OF MAGNETIC MICROSTRUCTURE IN $(CoFeZr)_x$-$(Al\text{-}O)_{100-x}$ NANOCOMPOSITES

The results of studies of structural, magnetic, optical and magnetooptical properties of $(CoFeZr)_x$-$(Al\text{-}O)_{100-x}$ nanocomposites are presented. It has been shown that the abnormal behavior of the TKE field dependences indicates the simultaneous presence of SPM and FM particles at x_c.

E.P14 Albert MASYUGIN

INFLUENCE OF THE SUBSTRATE ON THE MAGNETORESISTANCE OF BISMUTH GARNET FERRITE SUBSTITUTE BY RARE EARTH

The epitaxial $Nd_1Bi_2Fe_5O_{12}$(450 nm) /$Nd_2Bi_1Fe_4Ga_1O_{12}$(90 nm) films on a glass substrate and $Nd_{0.5}Bi_{2.5}Fe_5O_{12}$(450 nm) on a single-crystal GGG substrate grown in the crystallographic direction (111) were investigated. The films have a ferrimagnetic structure with a Curie temperature T_C=450 K. In the vicinity of T_C, the conductivity and impedance exhibit a kink characteristic of polaron-type current carriers.

E.P15 Alexey YURASOV

SIMULATION OF OPTICAL AND MAGNETO-OPTICAL PROPERTIES OF NANOCOMPOSITES $(CoFeZr)_x(Al_2O_3)_{1-x}$

In this paper, a simulation of the magneto-optical TKE for magnetic nanocomposite $(CoFeZr)_x(Al_2O_3)_{1-x}$ was carried out. We used the symmetrized Maxwell-Garnett approximation as the most optimal effective medium method for describing nanocomposites in a wide range of concentrations of the magnetic component. It was shown that the size of the granules and their size distribution are the key factors determining the optical and magneto-optical properties of the nanocomposite.

E.P16 Maksim SITNIKOV

IMPEDANCE AND IR SPECTROSCOPY OF FILMS $Ce_3Fe_5O_1$

Spintronics based on the transfer of information using spin waves is actively developed. In the manufacture of garnet ferrite films with a thickness of 200–400 nm, the film-substrate interface, where the formation of charged defects and the polycrystalline structure of the films is possible, plays a significant role. In this case, the formation of magnetic polarons on the interface is possible.

E.P17 Oleg SURDIN

HIGH MAGNETIC FIELD FACILITY FOR TRANSPORT AND OPTICAL MEASUREMENTS

The work is devoted to magneto-optical and transport measurements in magnetic fields up to 50 T. The results of cyclotron resonance and quantum Hall effect measurements in $HgTe/Hg_{1-x}Cd_xTe$ heterostructures are presented. Also the magnetic phase diagram of a $(LuBi)_3(FeAlGa)_5O_{12}$ thin film was studied.

E.P18 Yuri KUDASOV

INHOMOGENIUOS STATE OF FERRIMAGNETIC FILM NEAR COMPENSATION POINT

An earlier investigation of the $(LuBi)_3(FeAlGa)_5O_{12}$ film revealed an unusual precursor of the transition to noncollinear phase in the vicinity of the compensation temperature. It is shown that the precursor stems from the spatial inhomogeneity of the magnetic structure induced by the film-substrate interface. This effect is significant in the vicinity of the phase transition only where the magnetic system is sensible to small perturbations.

E.P19 Anatoliy DRUZHININ

MAGNETOOPTICAL REFRACTOMETRY FOR TRANSPARENT MEDIA

A new method for determining the refractive index is based on the intensity gyroelectric equatorial magnetooptical effect in transmission. The dependence of the magnitude of the effect on the angle of incidence of light is determined by the function with changing its sign at the Brewster angle. In the case when the external medium (vacuum or air) has n_1=1, we get the absolute refractive index of the substrate n_2.

E.P20 Mikhail SULIMOV

THE g-FACTOR OF $CuGaSe_2$: A MAGNETO-OPTICAL STUDY

In this study we examine high structural quality $CuGaSe_2$ single crystals using circular polarisation resolved magneto-reflectance (MR) at 4.2 K in magnetic fields up to 14 T. Analysing the dependence of the spectral position of the free *A* exciton on *B* in optical reflectance spectra measured for the right RCP (σ^-) and left LCP (σ^+) circular polarisations of light we determine the magnitude of the g-factor of $CuGaSe_2$ for the first time.

E.P21 Roman YUSUPOV

PROBING MAGNETIC INHOMOGENEITY IN THIN EPITAXIAL $Pd_{1-x}Fe_x$ FILMS WITH ULTRAFAST OPTICAL AND MAGNETOOPTICAL SPECTROSCOPY

We present the results of a systematic study of a series of epitaxial $Pd_{1-x}Fe_x$ films (x=0...0.08) utilizing ultrafast laser spectroscopy methods. We show that the complex multi-component character of the reflectivity transients appears below Curie temperature of the alloy. We refer it to magnetic inhomogeneity of the films. The measurements of ultrafast optical and magnetooptical responses of the diluted alloy based ferromagnetic films can shed light on their magnetic homogeneity.

E.P22 Sergey TARASENKO

FIRST-ORDER NONSPECULAR EFFECTS AT THE NORMAL INCIDENCE OF A QUASIPLANE WAVE ON A LAYERED MAGNETIC STRUCTURES (VOIGHT GEOMETRY)

It has been shown that space–time inversion symmetry breaking at the normal incidence of a quasiplane wave on an asymmetric multilayer structure in the Voigt geometry can result in the formation of the angular Goos–Hanchen effect at reflection and transmission, as well as the spatial Goos–Hanchen effect at transmission. The effects are characterized by nonreciprocity not only with respect to the inversion of direction of static magnetic field but also with respect to the permutation of nongyrotropic layers surrounding a gyrotropic layer.

E.P23 Nikolai SOKOLOV

MAGNETIZATION REVERSAL IN $NiFe_2O_4/SrTiO_3(001)$ NANOHETEROSTRUCTURES GROWN BY LASER MOLECULAR BEAM EPITAXY

The magnetization reversal process in $NiFe_2O_4$ films grown by laser molecular beam epitaxy on $SrTiO_3$(001) substrates was studied. It was found that for the orientation of the magnetic field close to an easy axis, magnetization switching goes by jumps caused by appearance and movement of domain walls. Near the hard axis the magnetization reversal is followed by appearance of domains with different orientations of magnetizations.

E.P24 Tatiana MURZINA

MAGNETO-OPTICAL EFFECTS IN Au/Ni BASED COMPOSITE HYPERBOLIC METAMATERIALS

We present the experimental studies of optical and magneto-optical effects in the two types of hyperbolic magnetic metamaterials: (*i*) arrays of gold nanorods in anodic aluminum oxide template supplemented by a continuous nickel film of the thickness of 15 nm, and (*ii*) composite nickel/gold nanorods arrays. Pronounced modification of magneto-optical effects near the epsilon near zero spectral point are discussed. The observed effects are compared with the results of theoretical modelling.

E.P25 Dmitry KUZMIN

HYPERBOLIC MAGNETO-PLASMONIC METASURFACES FOR SECOND HARMONIC GENERATION

In this work we propose a new class of hyperbolic magneto-plasmonic metasurface for second harmonic generation (SHG). We discuss three possible realizations of such a metasurfaces, which based on non-linear magneto-plasmonic multilayers. Theoretical models for investigation of SHG in above-mentioned realizations are performed.

E.P26 Maksim USIK

EXCITATION OF SURFACE PLASMONS IN GRAPHENE-MAGNETIC DIELECTRIC-GRAPHENE STRUCTURE

In this work, we theoretically investigated the excitation of surface plasmon-polaritons (SPPs) in graphene-magnetic dielectric-graphene structure by attenuated total reflection method. We calculated the light reflectance from the structure, which allows concluding what part of the energy of the incident wave has passed into the excitation of SPPs.

E.P27 Hyeong-Ryeol PARK

PLASMON NANOGAP-ENHANCED TRANSITION TEMPERATURE OF TERAHERTZ ACTIVE DEVICE BASED ON SUPERCONDUCTORS

We present terahertz optical properties of $GdBa_2Cu_3O_{7-x}$ superconducting thin films.

Section G. Frustrated and disordered magnetism

Poster area I.A

Chairpersons: Felix KASSAN-OGLY, Alexander SMIRNOV

G.P1 Magomedzagir BADIEV

CRITICAL PROPERTIES OF ISING MODEL ON A LAYERED-TRIANGULAR LATTICE WITH VARIABLE INTERPLANE EXCHANGE INTERACTION

The Monte Carlo replica algorithm studies of phase transitions and critical phenomena of the layered triangular antiferromagnetic Ising model with variable interlayer exchange interaction. Investigations were carried out for the ratios of the value of the intralayer J_1 and interlayer J_2 exchange interactions in the range of values $r=J_2/J_1 = 0.01 \div 1.0$. Using the method of Binder cumulant fourth order and histogram analysis of the data analyzes the nature of phase transitions.

G.P2 Anatoly RINKEVICH

TYPE OF MAGNETIC FIELD DEPENDENCY OF AC SUSCEPTIBILITY OF RARE EARTH TITANATES

Magnetic field dependency of AC susceptibility of nanocomposite rare earth titanates with pyrochlore structure has been studied. The nanocomposites have been prepared by impregnation of particles of Gd, Er, Sm, Nd titanates in inter-spherical voids of artificial opal matrices. The measurements of AC susceptibility have been carried out at frequencies from 10 Hz to 10 kHz at cryogenic temperatures. It is shown that magnetic field dependences of AC susceptibility obey to Cole-Cole-type formula.

G.P3 Albert BABAEV

PHASE TRANSITIONS IN THE TWO-DIMENSIONAL FOUR-VERTEX POTTS MODEL WITH QUENCHED NONMAGNETIC IMPURITIES

Based on the Monte Carlo method, phase transitions in the two-dimensional four-vertex Potts model with quenched nonmagnetic impurities are investigated.

G.P4 Dzhuma KURBANOVA

PHASE TRANSITIONS IN HEISENBERG ANTIFERROMAGNET ON A BCC LATTICE WITH COMPETING FIRST AND SECOND NEIGHBOR INTERACTIONS

Phase transitions in the antiferromagnetic Heisenberg model on a BCC lattice with allowance for the next-nearest-neighbor interactions.

G.P5 Alexander ZARUBIN

FRUSTRATIONS AND ORDERINGS ON ISING CHAIN WITH MULTIPLE INTERACTIONS

The frustration properties of the Ising model on a one-dimensional lattice are investigated taking into account the multiple exchange interactions. Exact analytical expressions for the thermodynamic and magnetic characteristics of the system are obtained. Criteria have been formulated for the occurrence of magnetic frustrations in the presence of competition between energies. The features of this model in the mode of frustration and its surroundings are investigated.

G.P6 Alexey PROSHKIN

FRUSTRATIONS AND PHASE TRANSITIONS IN ISING MODEL ON DECORATED SQUARE LATTICE

The Ising model on a decorated square lattice with different signs of interactions between neighboring spins is thoroughly examined. On a basis of famous Onsager solution with the help of decoration-iteration transformation exact analytical expression for a partition function is derived. Peculiar properties of heat capacity and entropy and their influence on phase transitions are discussed.

G.P7 Evgeny GERASIMOV

MAGNETIC FRUSTRATION IN LAYERED $La_{1-x}Gd_xMn_2Si_2$ COMPOUNDS

We present results of the magnetic frustration studies in the $La_{1x}R_xMn_2Si_2$ (R = Tb, Gd) layered compounds in which there are possibilities to purposefully change the *R–Mn*, *R–R* and *Mn–Mn* exchange interactions with increasing of x concentration.

G.P8 Egor TSUVAREV

ORDERING AND FRUSTRATIONS IN GENERALIZED ISING CHAIN

Generalized Kramers-Wannier transfer-matrix with translation on two periods of a lattice in Ising model is introduced. Points of intersections and lines of coexistence of phases are found. A property similar to supercooling and superheating is detected. At the triple points phases are completely frustrated which corresponds to critical opalescence. Exact expressions for heat capacity and entropy are obtained. Frustration fields and frustration values for the zero-temperature entropy are found.

G.P9 Gylkiz ATAEVA

INFLUENCE OF QUENCHED NON-MAGNETIC IMPURITIES ON PHASE TRANSITIONS IN THE TWO-DIMENSIONAL POTTS MODEL WITH q=5

The static thermodynamic and magnetic properties diluted systems described by 2D Potts model with states q=5, in which the quenched disorder is distributed as nonmagnetic impurities. The calculations are carried out for systems with periodic boundary conditions and spin concentrations $p \leq 0.9$ The systems of linear sizes $L \times L = N$, L = 10–160 are researched.

G.P10 Sergey MARTYNOV

GROUND STATE OF ORTHORHOMBIC WEAK ANTIFERROMAGNET $PbMnO_4$ WITH FRUSTRATED SINGLE ION ANISOTROPY

The model of the four sublattice magnet with the Heisenberg ferromagnetic exchanges and single ion anisotropies is considered. The orientation of classical moments is determined by numerical minimization of the classical spins ground energy. The magnetic structure is the superposition of the ferromagnetic moment directed along the orthorhombic axis and a cross-type antiferromagnetic component in the basal plane.

G.P11 Artem CHERNYSHEV

NEGATIVE MAGNETIZATION OF THE $Ni_{5.33}Ta_{0.67}B_2O_{10}$ CRYSTALS

The magnetic measurements, theoretical group analysis and an analysis of the possible magnetic structure using a simple indirect coupling model were performed.

G.P12 Nadezhda BELSKAYA

STRUCTURE AND MAGNETIC PROPERTIES OF THE $Mn_{3-x}Mg_xBO_5$ (x = 1.61, 1.78) SINGLE CRYSTALS

Oxyborates of transition metals reveal one of the most common classes of minerals that are associated with all stages of geological processes that determine particular interest in these systems from the point of view of geophysics and geochemistry. These objects were no less interesting from the point of view of fundamental physics. The coupling strength of the spin, orbital, electron, and lattice powers allows free use of charges and orbital elasticity, touching magnetic transitions, structural transformations accompanied by electrical conductivity anomalies, etc.

G.P13 Evgeniia VAVILOVA

THE INFLUENCE OF NONMAGNETIC DEFECTS ON THE SPIN DYNAMICS OF A FRUSTRATED CHAIN $LiCuSbO_4$ IN LOW AND INTERMEDIATE FIELDS

G.P14 Danila GAFUROV

INFLUENCE OF LITHIUM DEFICIENCY ON THE ION MOBILITY IN THE FRUSTRATED CHAIN COMPOUND $LiCuSbO_4$ STUDIED BY NMR

G.P15 Natalia TOPOROVA

$CrNb_3X_6$ COMPOUNDS (X = S, Se, Te) WITH QUASI TWO-DIMENSIONAL STRUCTURE: EVOLUTION FROM SPIRAL MAGNETIC STRUCTURE TO CLUSTER-GLASS

Layered compounds based on the niobium diselenide $Cr_{1/3}NbSe_2$ and niobium ditelluride $Cr_{1/3}NbTe_2$ interaclated with chromium atoms have been synthesized and studied by means of X-ray diffraction, magnetization and electrical resistivity measurements. It has been shown that unlike ferromagnetic order in the selenide compound $Cr_{1/3}NbSe_2$, the telluride compound $Cr_{1/3}NbTe_2$ exhibits a cluster glass behavior. The results obtained indicate a strong dependence of the magnetic state of intercalated compounds on the type of the matrix compound NbX_2.

G.P16 Maria SHLYAKHTICH

CRITICAL BEHAVIOR NEAR THE PERCOLATION THRESHOLD OF THE THREE-DIMENTIONAL ISING MODEL

In this work we investigate the critical behavior of the disordered three-dimensional Ising model with an impurity concentration close to the threshold of impurity percolation on high-performance computing systems. Starting from initial configurations, the system was updated with Metropolis algorithm and Invaded cluster algorithm. The values of dynamic critical exponent z and static critical exponent beta/nu were obtained in this paper for both algorithm.

G.P17 Sofya GOTOVKO

ELECTRON SPIN RESONANCE IN SPIRAL ANTIFERROMAGNET LINARITE

We present the results of ESR study of linarite, $PbCuSO_4(OH)_2$, in external magnetic field H. Linarite is one of the family of frustrated spin chains (S = 1/2) formed by the magnetic ions Cu^{2+} in oxygen surrounding with frustrated nearest neighbor ferromagnetic ($J_{NN} \approx -170$ K) and next-nearest neighbor antiferromagnetic ($J_{NN} \approx 46$ K) interactions. The obtained spectra give the information about ESR eigenfrequencies of the spin structure and allow defining the anisotropy constants.

Section I. Magnetism and superconductivity
Poster area III B.
Chairpersons: Yury PANOV, Dmitry DZEBISASHVILI

I.P1 Maria MAGNITSKAYA

SPIN-FLUCTUATION MECHANISM IN SUPERCONDUCTIVITY OF $Ba(Fe_{1-x}Co_x)_2As_2$ FERROPNICTIDES

Doping dependence of the superconducting state structure and spin-fluctuation pairing mechanism in the iron-based superconductors $Ba(Fe_{1-x}Co_x)_2As_2$ is studied. The performed study shows that in the regime when antiferromagnetism and superconductivity coexist, the spin-fluctuation pairing mechanism has a significant effect on superconductivity in the electron band, but its role in elevating the critical temperature of the $Ba(Fe_{1-x}Co_x)_2As_2$ compounds is relatively small.

I.P2 Tatiana KRINITSINA

MICROSTRUCTURE AND CRITICAL CURRENT OF BULK MgB_2 SUPERCONDUCTOR

Optimal regimes of synthesis, deformation and following annealings have been worked out for obtaining MgB_2 superconductors with great number of pinning centers in the structure, ensuring high critical current density J_c. After the deformation-heat treatment and recovering annealing the grains form dense conglomerates with dispersed oxide inclusions and higher magnesium borides, the sizes of 10-70 nm, which serve additional pinning centers and ensure the three times increasing of J_c.

I.P3 Anna KLEPIKOVA

LATERAL VORTEX MOTION IN HIGHLY LAYERED SUPERCONDUCTOR $Nd_{2-x}Ce_xCuO_4$

We analyzed carrier transport and the motion of a vortex system in the electron-doped high-temperature superconductor $Nd_{2-x}Ce_xCuO_4+\delta$ in underdoped and optimally doped (x = 0.135, 0.145, 0.15) regions, in the area of evolution from antiferromagnetic to superconducting - order. We have made the comparison of the processes developing in the conducting CuO_2 layers and across the layers.

I.P4 Maksim SHUSTIN

MAJORANA POLARIZATION AND CALORIC ANOMALIES IN STRONGLY CORRELATED SUPERCONDUCTING NANOWIRES

Taking into account strong electron-electron correlations, using the density matrix renormalization group approach and the ideology of atomic representation, the stability analysis of the series of caloric anomalies in the topologically nontrivial phase of the superconducting nanowire was analyzed. Special attention is paid to the correct definition of a topologically nontrivial parameter area and the consideration of the Majorana modes in strongly correlated 1D systems.

I.P5 Evgeniy EREMIN

MAGNETIC PROPERTIES OF $Eu_{1-x}La_xFe_3(BO_3)_4$ FERROBORATE

In this work the experimental investigations of the field and temperature dependences of magnetization $M_{a,c}(B)$ of $Eu_{0.5}La_{0.5}Fe_3(BO_3)_4$ have been performed. The paramagnetic temperatures $\theta_{\parallel}$, $\theta_{\perp}$ for magnetic field H=0.1 T applied in geometry $H_{\parallel}c$ and $H \perp c$ are equal to –132 and –100 K, respectively. These values are smaller in absolute value than in $EuFe_3(BO_3)_4$, where $\theta_{\parallel}$, $\theta_{\perp}$ for magnetic field H=0.6 T applied in geometry $H_{\parallel}c$ and $H \perp c$ are equal to -162 and -136 K, respectively.

THURSDAY

I.P6 Vyacheslav NEVEROV

ELECTRONIC PROPERTIES AND X-RAY ABSORPTION SPECTRA OF $Ba_{1-x}K_xBiO_3$

The band structure, density of states, and X-ray K-edge absorption spectra of oxygen were calculated for perovskite HTSCs based on $BaBiO_3$ for different levels of potassium doping using the density functional theory. It is shown that taking into account local structural inhomogeneities caused by doping allows one to correctly describe changes in the properties of the electronic subsystem near the Fermi level. The appearance of hole carriers with doping on a hybridized orbitals is demonstrated.

I.P7 Alexander BOBKOV

THERMALLY INDUCED SPIN-TRANSFER TORQUES IN S/F BILAYERS

We study the spin Seebek effect in S/F thin films in the presence of domain walls in the ferromagnet. It is demonstrated that in this case the thermally generated spin currents exert a torque on the domain wall. We develop a microscopic theory of the thermally-induced torque in S/F hybrids. The motion of an unpinned DW can be triggered by small temperature gradients even in the absence of a dissipative anti-damping STT.

I.P8 Mikhail BELODEDOV

CRITICAL CURRENTS IN STRIPS OF GRANULAR SUPERCODUCTORS

The previously proposed phenomenological model of a granular superconductor is used to simulate the flow of direct current through the strip lines from the htsp. The dependence of the critical current of the superconducting strip on the external magnetic field is obtained by numerical simulation. Ways of increasing the critical current of such strips are proposed.

I.P9 Sergey NIKOLAEV

ANOMALOUS SPECTRAL PROPERTIES OF STRONGLY CORRELATED SYSTEMS WITHIN THE CLUSTER PERTURBATION THEORY

Investigation of the spectral properties of strongly correlated systems within the cluster perturbation theory in Hubbard operators representation.

I.P10 Irina ANISHCHENKO

THE DYNAMIC PROCESSES IN SECOND GENERATION HTS TAPES UNDER THE PULSED CURRENT AND MAGNETIC IMPACT

This paper presents the results of complex multiphysical modeling of non-equilibrium states arising in high-temperature superconducting composites under current, magnetic, and combined control switching impacts types. The dynamics of electrophysical processes occurring in the HTS composites layered structure taking into account the influence of local thermal processes in the composite structure were investigated.

I.P11 Rashid GAIFULLIN

THE ROLE OF ADDITIONAL LAYER N OR S2 IN SUPERCONDUCTING TRIPLET SPIN-VALVE S1/F1/N(S2)/F2

We investigate the critical temperature T_c of S1/F1/N(S2)/F2 structure (Si is a singlet superconductor, Fi is a ferromagnetic metal, N is a normal metal), where the long-range triplet superconducting pairing is generated at noncollinear magnetizations of the F layers. Compared with the additional normal layer in an S1/F1/N/F2 structure, the possibility of increasing the efficiency of the spin valve modes in a structure with an additional superconducting layer S2 instead of N is discussed.

I.P12 Ilya MAKAROV

INFLUENCE OF CuO_2 LATTICE STRAIN ON THE ELECTRONIC STRUCTURE OF HIGH-T_c CUPRATE FAMILY

Doping and strain dependences of the electronic structure of the CuO_6-octahedra layer within LDA+GTB method in the frameworks of five-band p-d model are calculated. Doping results in reconstruction of the band structure and Fermi contour topology, redistribution of the spectral weight. Strain increasing leads to band displacement, bandwidths decreasing and shift of the concentrations of quantum phase transitions. Strain dependences of the exchange coupling and DOS determining T_c are obtained.

I.P13 Sergey SEMENOV

NEW APPROACH TO DESCRIBING DISSIPATION IN GRANULAR HTSs

We proposed a new approach to describing the dissipation in the subsystem of intergrain boundaries of granular HTSs in the external field. The approach is based on accounting for the effect of magnetic moments of superconducting grains on the resulting (effective) field in the intergrain medium. Substitution of the effective field into the Arrhenius expression for describing the dissipation processes allowed us to describe well the observed *R(H)* and *R(T)* dependences for the granular HTSs.

I.P14 Levan ICHKITIDZE

MAGNETIC FIELD SENSOR BASED ON CERAMIC HIGH TEMPERATURE SUPERCONDUCTOR

We investigated a magnetic field sensor based on ceramic high-temperature superconducting material of the Bi-2223 system. This sensor has a sensitivity threshold of less than 10 pT, works in differential magnetic modulation mode at the boiling point of liquid nitrogen and can compete with HTSC SQUIDs. In particular, this sensor can be used for non-invasive registration of magnetic particles, as well as for monitoring various implantable devices or artificial organs in biological objects

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An introduction to the company and its products

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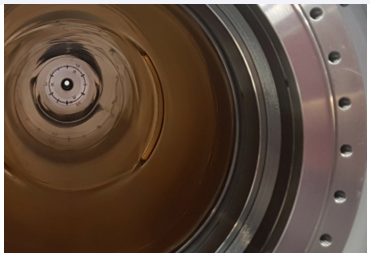

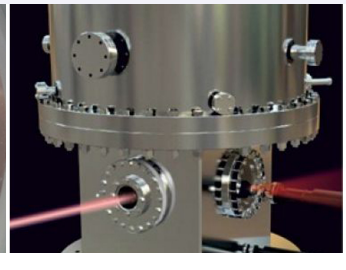

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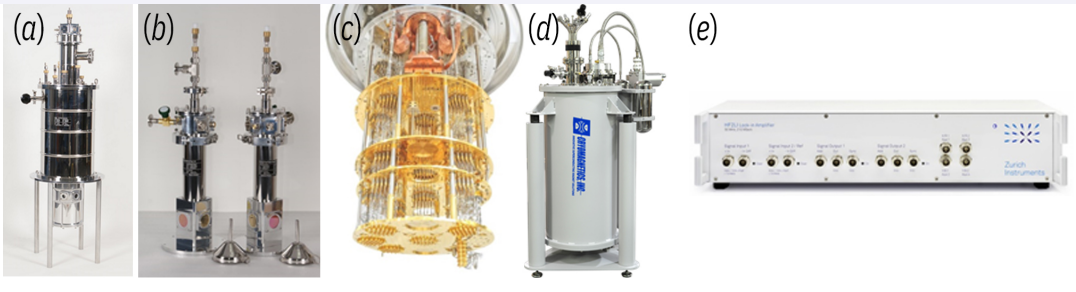

(*a*) — LHe filled cryostat LH-320-1.5; (*b*) — LN_2 filled cryostats LN-120-T-SSH; (*c*) — He^3-He^4 dilution cryostat Blufors XLD-series; (*d*) — Superconducting closed cycle magnet Cryomagnetics C-Mag; (*e*) — Lock-in amplifiers Zurich Instruments HF2LI

Author Index

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