AGH University of Science and Technology

Faculty of Physics and Applied Computer Science

Annual Report 2013

Akademia Górniczo-Hutnicza

im. Stanisława Staszica w Krakowie

Wydział Fizyki i Informatyki Stosowanej

Raport Roczny 2013

AGH

Akademia Górniczo-Hutnicza im. Stanisława Staszica w Krakowie

WYDZIAŁ FIZYKI I INFORMATYKI STOSOWANEJ

KNOW Krajowy Naukowy Ośrodek Wiodący 2012-2017 Leading National Research Centre

Krakowskie Konsorcjum Naukowe im. Mariana Smoluchowskiego materia energia przyszłość

Faculty of Physics and Applied Computer Science

Wydział Fizyki i Informatyki Stosowanej AGH

DEAN
prof. dr hab. Janusz Wolny

DEPUTY DEAN FOR SCIENCE AND COOPERATION
prof. dr hab. inż. Bartłomiej Szafran

DEPUTY DEAN FOR EDUCATION
dr hab. inż. Zdzisław Stęgowski
dr hab. Łukasz Gondek

DEPUTY DEAN FOR STUDENT AFFAIRS
dr inż. Paweł Armatys

ADMINISTRATIVE DIRECTOR
dr inż. Janusz Chmist

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Wstęp

The Faculty of Physics and Applied Computer Science (FPACS) is one of the fifteen Faculties of the AGH University of Science and Technology in Cracow. The origins of the Faculty date back to foundation of the Academy of Mining in 1919 including the Chair of Physics. Over the following decades the Chair has undergone several organizational transformations until in 1991 the AGH Senate has decided to form the Faculty of Physics and Nuclear Techniques. In 2004 the name was changed to Faculty of Physics and Applied Computer Science, to follow the changes in the fields of scientific and educational activity.

Scientific activity of the Faculty comprises both basic and applied research in solid state physics, nuclear and elementary particles physics, medical physics, physics of the environment and computer science.

The Faculty is the Leader of the Marian Smoluchowski Krakow Scientific Consortium that has been awarded the status of the Leading National Research Centre (KNOW) for 2012-2017.

The Faculty in 2013 has been awarded the highest (A+) category of research units in Poland as one of 37 institutes out of 960 that have been evaluated by the Research Units Evaluation Committee.[1]

There are six departments within the Faculty:

1. Department of Applied Informatics and Computational Physics
(Katedra Informatyki Stosowanej i Fizyki Komputerowej)

2. Department of Applied Nuclear Physics
(Katedra Zastosowań Fizyki Jądrowej)

3. Department of Medical Physics and Biophysics
(Katedra Fizyki Medycznej i Biofizyki)

4. Department of Solid State Physics
(Katedra Fizyki Ciała Stałego)

5. Department of Particle Interaction and Detection Techniques
(Katedra Oddziaływań i Detekcji Cząstek)

6. Department of Condensed Matter Physics
(Katedra Fizyki Materii Skondensowanej)

The faculty personel is formed by 175 employees including 120 teachers and researchers as well as 55 technical and administrative staff. The faculty staff contains 48 full professors and 73 assistant professors or post-docs.

Faculty offers several degree programs leading to B.Sc., M.Sc. and Ph.D. degrees.

[1] *"Research units with the prestigious "A+" category, together with the the National Leading Research Centres, are the elite of Polish science"* - Prof. Barbara Kudrycka, Minister of Science and Higher Education

The undergraduate studies consist of seven-semester bachelor programs in three distinct areas: technical physics, medical physics and applied computer science. They are followed by three-semester graduate programs, leading to the M.Sc. degree in the various specializations.

Area: **Medical Physics**; specializations:
Dosimetry and Electronics in Medicine,
Imaging and Biometrics,

Area: **Technical Physics**; specializations:
Solid State Physics,
Nuclear Physics,
Environmental Physics,

Area: **Applied Computer Science**; specialization:
Data Modeling and Analysis
Computer Graphics and Image Processing
Reconfigurable and Embedded Systems
Computer Methods in Science and Technology (in English)

Faculty leads teaching in both general physics courses and specialized branches of physics for students of all the Faculties of the AGH-UST. The teaching covers both reading lectures as well as organizing tutorials (physics problems classes) and laboratory work. Faculty's teaching assignments for students of other faculties include both undergraduate and graduate levels. Some of lectures are offered in English, in particular the entire PhD study course.
Faculty organizes complementary courses for the 1st year students of the University in physics (parallel to complementary courses in mathematics, organized by the Faculty of Applied Mathematics). The aim of the courses is to fill possible gaps in the high-school education to increase the efficiency of the training for the candidates who undertook such studies.

Faculty hosts two four-year programs of Ph.D. Studies in Physics. The first of them are the regular Ph.D. studies in the fields related to the research interests of Faculty members, i.e. technical nuclear physics, condensed matter physics, high energy physics, nuclear electronics, environmental physics. The second Ph.D. program started on the 1st October 2009 co-organized with Cracow's Institute of Nuclear Physics and Institute of Catalysis and Surface Chemistry (both Institutes are units of the Polish Academy of Science – PAS). The program under the name **"Interdisciplinary PhD Studies (ISD): New Materials for Modern Technologies and Future Energetics"** is financed by the EU Structural Funds (Program: Human Capital). The ISD goal is training high-class specialists, with the Ph.D. degree, in fields recognized as strategically important in EU and presented under the general terms: Info, Bio, Nano and Techno. The program of the Ph.D. studies covers a wide variety of physical, chemical and technological topics in materials science and modern energetics. Moreover in 2013 the Faculty started environmental PhD studies in physics and mathematics with cooperation of the Faculty of Applied Mathematics of AGH Technical University.

Faculty offers also a three semester Post-diploma (part-time) Study for Teachers. The studies are intended for primary and secondary school teachers, who want to gain additional qualifications giving them right to teach: physics, mathematics, chemistry, computer science, natural sciences and technical education.

Physicists – Doctors Honoris Causa of AGH University of Science and Technology

PROF. MARIAN MIĘSOWICZ
1979
PROF. ANDRZEJ OLEŚ
1995
PROF. MICHAŁ HELLER
1996
PROF. ANDRZEJ Z. HRYNKIEWICZ
1999
PROF. MANUEL RICARDO IBARRA
2008
PROF. JURGEN M. HÖNIG
2010
PROF. DAN SHECHTMAN
2013

Physicist – Honorary Consul of AGH University of Science and Technology

PROF. ROLF-DIETER HEUER (GENERAL DIRECTOR OF CERN)
2009

Physicist – AGH-UST Honorary Professor

PROF. JERZY NIEWODNICZAŃSKI
2009

Long-term visitors

PROF. LAURENT CHAPUT - UNIWERSYTET NANCY, FRANCE
07.01.2013-30.01.2013 oraz 04.06.2013-21.06.2013
PROF. MAREK MIHALKOVIC SLOVAK ACADEMY OF SCIENCE , SLOVAKIA
03.03.2013-23.03.2013 oraz 09.06.2013-15.06.2013
PROF. IVO UTKE - EMPA, SWEES, SWITZERLAND
07.04.2013-28.04.2013
PROF. STEFAN CHROMIK - INSTITUTE OF ELECTRICAL ENGINEERING SLOVAK ACADEMY OF SCIENCE
10.10.2013 - 09.11.2013
PROF. RITUPARNA CHAKI - INDIE WEST BENGAL UNIWERSITY OF TECHNOLOGY
02.10.2013 - 31.10.2013

Departments, Groups and Leaders, Achievements in 2013
Katedry, Zespoły i ich kierownicy, Najważniejsze osiągnięcia w 2013 r.

Department of Solid State Physics
Katedra Fizyki Ciała Stałego

STAFF

HEAD

prof. dr hab. Czesław Kapusta, full professor

MAGNETIC BULK- AND NANOMATERIALS GROUP
ZESPÓŁ MATERIAŁÓW MAGNETYCZNYCH LITYCH I NANOMATERIAŁÓW

prof. dr hab. Czesław Kapusta, full professor
dr. hab. Janusz Przewoźnik, assistant professor
dr. inż. Marcin Sikora, assistant professor
dr. Jan Żukrowski, assistant professor
dr. inż. Damian Rybicki, assistant professor
dr. inż. Jan Michalik, assistant professor
mgr inż. Andrzej Lemański, teaching assistant
prof. Ivo Utke, EMPA, Thun, Switzerland, Visiting Professor

supporting staff:
Jolanta Syrek
mgr Aleksander Pilipowicz
mgr inż. Wacław Musiał
inż. Tadeusz Kazała
Mariusz Bąkowski

MAGNETIC, ELECTRICAL AND STRUCTURAL RESEARCH GROUP
ZESPÓŁ BADAŃ MAGNETYCZNYCH, ELEKTRYCZNYCH I STRUKTURALNYCH

dr hab. Antoni Paja, associate professor
dr hab. Łukasz Gondek, assistant professor
dr Joanna Czub, assistant professor
dr inż. Janusz Niewolski, teaching assistant

SUPERCONDUCTING AND MAGNETIC MATERIALS GROUP
ZESPÓŁ MATERIAŁÓW NADPRZEWODZĄCYCH I MAGNETYCZNYCH

prof. dr hab. Andrzej Kołodziejczyk, full professor
prof. dr hab. inż. Zbigniew Kąkol, full professor (since 01.10.2013)
dr hab. inż. Andrzej Kozłowski, associate professor
dr hab. inż. Zbigniew Tarnawski, associate professor
dr inż. Janusz Chmist, assistant professor
dr inż. Waldemar Tokarz, assistant professor
dr hab. Wiesław Woch, assistant professor
dr Ryszard Zalecki, research assistant
dr inż. Wojciech Tabiś, assistant professor

SURFACE NANOSTRUCTURES GROUP
ZESPÓŁ NANOSTRUKTUR POWIERZCHNIOWYCH

prof. dr hab. Józef Korecki, full professor
dr Wojciech Karaś, assistant professor
dr Tomasz Ślęzak, assistant professor
dr inż. Michał Ślęzak, research assistant
dr Bartosz Strzelczyk, research assistant
dr inż. Krzysztof Matlak, research assistant
dr inż. Ewa Młyńczak, research assistant

Prof. dr hab. inż. Marek Przybylski (ACMiN AGH), full professor

PROFILE

Scientific activity of the Department concentrates on the studies of structural, magnetic and electronic properties and phenomena in the nano- and sub-nanometric thin films, metal-oxide nanostructures and multilayers for magnetic, magnetoresistive and catalytic applications, in the rare earth-3d element intermetallics and their interstitial solutions of hydrogen, carbon and nitrogen, in superconductors, including the HTc ones, in magnetic oxides, including magnetite and the colossal - and low field magnetoresistive ones, in topological insulators, in nanoparticle magnetic materials for MRI contrast and magnetic hyperthermia, in molecular magnets as well as in disordered metallic materials. The experimental facilities of the Department include:

1. MBE set-up for preparation and analysis of thin films and nanostructures, equipped with LEED, AES, MOKE and CEMS with UHV sample transfer possibility.

Działalność naukowa Katedry koncentruje się na badaniach własności i zjawisk strukturalnych, magnetycznych i elektronowych w nano- i sub-nanometrowych cienkich warstwach, nanostrukturach metal-tlenek i wielowarstwach do zastosowań magnetycznych i katalitycznych, w związkach międzymetalicznych ziem rzadkich z pierwiastkami 3d i ich roztworów międzywęzłowych wodoru, węgla i azotu, w nadprzewodnikach, w tym wysokotemperaturowych, w tlenkach magnetycznych, w tym wykazujących kolosalny i niskopolowy magnetoopór oraz w magnetycie, w izolatorach topologicznych, w materiałach nanocząstkowych na środki kontrastowe do MRI i do hipertermii magnetycznej, w magnetykach molekularnych oraz w nieuporządkowanych materiałach metalicznych.

2. ARUPS-XPS spectrometer.
3. Scanning tunneling microscope, 30-300 K temperature range.
4. VSM, AC susceptometer, ESR spectrometer, set-up for magnetoresistance measurements with closed circle refrigerator and calorimeter for specific heat measurements in 2-300 K range.
5. X-ray diffractometers (2) with temperature controll within 2-450 Kand 300-1450 K range.
6. Physical Property Measurement System (Quantum Design model, closed circle liquifier) equipped with 9 Tesla magnet, 2-400 K (VSM: 2-1100 K) temperature range, options: DC susceptibility, magnetisation, torque magnetometry, AC susceptibility, resistance/magnetoresistance, thermal expansion & magnetostriction, thermal transport & thermoelectric properties, specific heat.
7. Moessbauer spectrometers (4), transmission & CEMS, for 6 isotopes, 4-1000 K temperature range.
8. NMR spectrometers for proton resonance (15 MHz) and for magnetic materials, 5-1000 MHz, closed circle refrigerator, 2-300 K.
The research staff of the Department extensively uses synchrotron beamlines as well as neutron and muon facilities at the laboratories abroad.

Baza aparaturowa Katedry zawiera:
1. Zestaw MBE do preparatyki i analizy cienkich warstw i nanostruktur, wyposażony w układy LEED, AES, MOKE i CEMS z możliwością transferu próbek w warunkach ultrawysokiej próżni.
2. Spektrometr ARUPS-XPS.
3. Skaningowy mikroskop tunelowy, zakres temperatur 30-300 K.
4. VSM, susceptometr AC, spektrometr ESR, zestaw do pomiarów magnetooporu z chłodziarką, kalorymetr do pomiarów ciepła właściwego w zakresie 2-300 K.
5. Dyfraktometry rentgenowskie (2) z regulacją temperatury 2-450 K i 300-1450 K.
6. Zestaw do pomiarów własności fizycznych - (PPMS-Quantum Design, skraplarka helowa w zamkniętym obiegu), magnes 9 Tesli, zakres temperatur 2-400 K (VSM: 2-1100 K), opcje: podatność DC, namagnesowanie, magnetometr torsyjny, podatność AC, opór/magnetoopór, rozszerzalność termiczna & magnetostrykcja, transport cieplny & własności termoelektryczne, ciepło właściwe.
7. Spektrometry moessbauerowskie (4), transmisja & CEMS, 6 izotopów, zakres temperatury 4-1000 K.
8. Spektrometry NMR do rezonansu protonowego (15 MHz) i do materiałów magnetycznych, 5-1000 MHz, chłodziarka helowa w zamkniętym obiegu, 2-300 K.
Pracownicy naukowi Katedry są użytkownikami wiązek promieniowania synchrotronowego oraz laboratoriów neutronowych i mionowych w zagranicznych ośrodkach badawczych.

ACHIEVEMENTS

Determination of structural and magnetic properties of Fe/CoO(001) and Fe/CoO(111) bilayers: Effect of crystal orientation on the exchange bias (publication in Phys. Rev. B distinguished as Editor's suggestion).

Determination of the nanostructure of Co ad-atoms at the surface of topological insulator Bi_2Se_3 with scanning tunneling microscopy and their magnetic properties with XMCD method; observation of change from a parallel anisotropy to the perpendicular one with increasing number and clusterization of atoms.

Finding that the Verwey transition in magnetite is an effect of charge fluctuations strongly coupled to different modes of crystal lattice vibrations, on the basis of inelastic X-ray scattering.

Obtaining materials of Ti-Zr-Ni system doped with Mn and Co that stay amorphous after hydriding, which is very rarely observed.

Calculation of electrical resistivity of monoatomic layers in function of temperature and explanation of the nature of the metal-insulator transition observed in amorphous GdSi alloy.

Determination of electron transfer channels related to the temperature bistability of a Co-Fe-W molecular magnet.

Determination of the crystallographic structure and the character of magnetic ordering in multiferroic Aurivillius phases.

Determination of structure and electronic properties of titanium dioxide thin films with oxygen nonstoichiometry and anion doping.

Określenie strukturalnych i magnetycznych właściwości dwuwarstw Fe/CoO(001) i Fe/CoO(111): Wpływ orientacji krystalicznej na polaryzację wymienną (publikacja w Phys. Rev. B wyróżniona jako sugestia edytora).

Określenie nanostruktury ad-atomów Co na powierzchni izolatora topologicznego Bi_2Se_3 metodą skaningowej mikroskopii tunelowej oraz ich właściwości magnetycznych metodą XMCD; stwierdzenie zmiany anizotropii równoległej na prostopadłą przy wzroście liczby i klasteryzacji tych ad-atomów.

Stwierdzenie, że przemiana Verweya w magnetycie jest efektem fluktuacji ładunkowych silnie związanych z różnymi modami drgań sieci krystalicznej, na podstawie wyników pomiarów nieelastycznego rozpraszania promieni X.

Uzyskanie materiałów w układzie Ti-Zr-Ni domieszkowanych Mn i Co, które po nawodorowaniu pozostają w fazie amorficznej, co jest bardzo rzadko spotykane.

Obliczenie oporności elektrycznej monoatomowych warstw metalicznych w funkcji temperatury i wyjaśnienie natury przejście metal-izolator obserwowanego eksperymentalnie w amorficznym stopie GdSi.

Określenie kanałów transferu elektronowego związane z bistabilnoscią temperaturową magnetyka molekularnego Co-Fe-W.

Określenie struktury krystalicznej i charakteru uporządkowań magnetycznych w multiferroicznych fazach Aurivilliusa.

Określenie struktury i właściwości elektronowych cienkich warstw dwutlenku tytanu z niestechiometrią tlenową i domieszkowaniem anionowym.

ACTIVITY

Ł. GONDEK, J. CZUB

- Member of the Małopolska Regional Committee of the Physics Competition

- Członek Małopolskiego Okręgowego Komitetu Olimpiady Fizycznej

Ł. GONDEK

- Member of the Scientific Selection Panel of Helmholtz-Zentrum Berlin

- Członek panelu naukowego Instytutu Helmholtza w Berlinie

CZ. KAPUSTA

- Board Member of the Polish Synchrotron Radiation Society
- Member of Senate of AGH

- Członek Zarządu Polskiego Towarzystwa Promieniowania Synchrotronowego
- Członek senatu AGH

A. KOŁODZIEJCZYK

- V-ce Chairman of the Conference „XVI National Conference on Superconductivity Unconventional superconductivity and strongly correlated systems ” Październik 7-12, 2013 Zakopane

- V-ce przewodniczący konferencji „XVI National Conference on Superconductivity Unconventional superconductivity and strongly correlated systems” Październik 7-12, 2013 Zakopane

A. PAJA

- President of the General Control Committee of the Polish Physical Society

- Przewodniczący Głównej Komisji Rewizyjnej Polskiego Towarzystwa Fizycznego.

J. KORECKI

- Supervision of X-ray photoemission microscope (X-PEEM) at the NanoXAS beamline at Swiss Light Source, development of the experimental beam-line at the Polish National Synchrotron Source SOLARIS.

- Nadzór nad mikroskopem fotoemisyjnym (X-PEEM) na stanowisku NanoXAS w Swiss Light Source, budowa linii pomiarowej na polskim synchrotronie SOLARIS.

M. PRZYBYLSKI

- Member of the Programme Committee of the INTERMAG-2014, 4-8 May 2014, Dresden, Germany
- Chairman of the Organising and Programme Committee 22nd International Colloquium on Magnetic Films and Surfaces, 12-17 July 2015, Krakow, Poland
- Director of ACMIN-AGH

- Członek Komitetu Programowego INTERMAG-2014, 4-8 May 2014, Dresden, Germany
- Przewodniczący Komitetu Organizacyjnego i Komitetu Programowego 22nd International Colloquium on Magnetic Films and Surfaces, 12-17 July 2015, Krakow, Poland
- Dyrektor ACMiN-AGH

Department of Medical Physics and Biophysics
Katedra Fizyki Medycznej i Biofizyki

STAFF

HEAD

prof. dr hab. inż. Marek Lankosz, full professor

BIOMEDICAL AND ENVIRONMENTAL RESEARCH GROUP
ZESPÓŁ BADAŃ BIOMEDYCZNYCH I ŚRODOWISKOWYCH

prof. dr hab. inż. Marek Lankosz, full professor
dr hab. inż. Zdzisław Stęgowski, associate professor
dr hab. inż. Magdalena Szczerbowska-Boruchowska, associate professor
dr hab. inż. Dariusz Węgrzynek, associate professor (on leave IAEA)
dr inż. Joanna Dudała, assistant professor
dr inż. Leszek Furman, assistant professor
dr inż. Lucyna Samek, assistant professor
dr inż. Mateusz Czyżycki, teaching assistant (on leave DESY Photon Science)
dr Beata Ostachowicz, teaching assistant
mgr Antoni Ostrowski
inż. Adam Wierzbicki

MOLECULAR BIOPHYSICS AND BIOENERGETICS GROUP
ZESPÓŁ BIOFIZYKI MOLEKULARNEJ I BIOENERGETYKI

prof. dr hab. Kvetoslava Burda, professor
dr Joanna Fiedor, assistant professor
dr Aleksandra Orzechowska, assistant professor
dr Renata Szymańska, assistant professor

BIOMEDICAL IMAGING AND MODELING GROUP
ZESPÓŁ OBRAZOWANIA I MODELOWANIA

prof. dr hab. Henryk Figiel, full professor
dr hab. Zenon Matuszak, associate professor
dr inż. Joanna Chwiej, assistant professor
dr inż. Aleksandra Jung, assistant professor
dr inż. Katarzyna Matusiak, assistant professor
dr Krzysztof Turek, assistant professor

MOESSBAUER SPECTROSCOPY GROUP
ZESPÓŁ SPEKTROSKOPII MÖSSBAUEROWSKIEJ

prof. dr hab. Stanisław Dubiel, full professor
dr inż. Jakub Cieślak, assistant professor

PROFILE

The Department of Medical Physics and Biophysics consists of four research groups.
The research activities of Biomedical Imaging and Modeling Group cover the subjects of Magnetic Resonance Imaging based on Nuclear Magnetic Resonance, optical imaging, modeling of physiological processes, nuclear medicine imaging and dosimetry in diagnostics and therapy with application of radioactive elements, application of advanced spectroscopic methods in biomedical research. The research at Biomedical and Environmental Research Group relates mainly to the investigation of the role of biomodulators in the biochemical mechanism of the pathogenesis and progress of cancers and neurodegeneration. Molecular Biophysics and Bioenergetics Group research is focused on: photosynthetic electron transport and oxygen evolution, organization and physical/chemical properties of native and model dye-protein-lipid systems, topography, elasticity and adhesion of normal and pathological cells as well as chemical properties of functionalized carbon nanotubes. The research interest of Mossbauer Spectroscopy Group includes bio-farmaceutico-medical physics. The main object of the research conducted in the Laboratory of Mössbauer Spectroscopy concerns investigation of various physical properties of technologically important alloys and compounds. Additional interest includes use of the Mössbauer Spectroscopy in the investigation of Fe-containing samples of organic or/and pharmaceutical origin or application (like ferritin, antianemic medicaments etc).

Katedra Fizyki Medycznej i Biofizyki składa się z czterech zespołów badawczych. Działalność naukowa Zespołu Obrazowania i Modelowania obejmuje tematykę obrazowania magnetyczno-rezonansowego opartego o zjawisko magnetycznego rezonansu jądrowego, obrazowania optycznego, modelowania procesów fizjologicznych, obrazowania oraz dozymetrii w diagnostyce i terapii z wykorzystaniem izotopów promieniotwórczych w medycynie nuklearnej oraz wykorzystanie zaawansowanych metod spektroskopowych w badaniach biomedycznych. Badania naukowe prowadzone w Zespole Badań Biomedycznych i Środowiskowych dotyczą głównie wyjaśnienia roli biomodulatorów w mechanizmach biochemicznych patogenezy nowotworów i chorób neurodegeneracyjnych. Zespół Biofizyki Molekularnej i Bioenergetyki zajmuje się badaniem: fotosyntetycznego transportu elektronów i wydzielania tlenu; organizacji i własności fizyko-chemicznych natywnych i modelowych układów barwnikowo-białkowo-lipidowych; topografii, elastyczności i adhezji zdrowych i patologicznych komórek oraz chemicznych własności funkcjonalizowanych nanorurek węglowych. Zainteresowania naukowe Zespołu Spektroskopii Moessbauerowskiej koncentrują się na fizyce ciała stałego oraz fizyce bio-farmako-medycznej. Główna tematyka naukowa dotyczy badania różnych własności fizycznych stopów i związków technologicznie ważnych. Ponadto zainteresowania naukowe obejmują wykorzystanie spektroskopii moessbauerowskiej w badaniach postaci i własności żelaza, znajdującego się w próbkach organicznych (np. ferrytyna), a także w materiałach farmakologicznych (lekach) i innych materiałach o zastosowaniach medycznych.

BIOMEDICAL AND ENVIRONMENTAL RESEARCH GROUP

The research at the Biomedical and Environmental Research Group relates to the development and application of nuclear analytical methods and examination of dynamic systems. The main topics of interest are biomedical research, environmental science, and protection of cultural heritage. Of particular importance is the investigation of the role of biomodulators in the biochemical mechanisms of the pathogenesis and progress of brain gliomas and neurodegeneration. The elemental and molecular chemical micro imaging is performed with the use of the techniques based on synchrotron radiation, i.e. synchrotron radiation X-ray fluorescence (SRXRF), X-ray absorption near edge structure (XANES) spectroscopy, extended X-ray absorption fine structure (EXAFS) spectroscopy and Fourier transform infrared micro spectroscopy (FTIR). The investigations in environmental science are connected with the influence of air pollution on cultural heritage and on urban and rural environments. Statistical methods are used for identification of possible sources of air pollutants emission.

The scope of research is also application of computational fluid dynamics (CFD) methods for prediction of related physical phenomena and evolution of dynamic system. The CFD results are validated by tracer experiments. These methods have been applied to characterize flow in jet mixers, pipes and in hydrocyclone classifiers.

The laboratory is equipped with state-of-art facilities including X-ray fluorescence and infrared confocal microscopes, multifunctional X-ray fluorescence spectrometer for localized and bulk elemental ultra trace analysis.

Projekty badawcze realizowane w Zespole Badań Biomedycznych I Środowiskowych dotyczą opracowania i zastosowania jądrowych metod pomiarowych oraz badania systemów dynamicznych. Główne kierunki zainteresowań obejmują badania biomedyczne, środowiskowe jak również ochronę dziedzictwa kulturowego. Szczególnie ważne jest wyjaśnienie roli biomodulatorów w procesach biochemicznych wzrostu nowotworów i neurodegeneracji. Do obrazowania rozkładu pierwiastków i biomolekuł w tkankach na poziomie komórkowym stosowane są techniki oparte na promieniowaniu synchrotronowym tzn. synchrotronowa rentgenowska analiza fluorescencyjna (SRXRF), absorpcja promieniowania X w pobliżu progu absorpcji (XANES), spektroskopia wykorzystująca strukturę subtelną blisko progu absorpcji (EXAFS) oraz mikro-spektroskopia promieniowania podczerwonego z zastosowaniem transformacji Fouriera (FTIR).

Tematyka naukowa w zakresie ochrony środowiska dotyczy badania wpływu zanieczyszczeń powietrza na obiekty muzealne oraz degradację środowiska miejskiego i wiejskiego. Do określania źródeł emisji zanieczyszczeń powietrza stosowane są zaawansowane metody statystyczne.

Zakres badań obejmuje zastosowania metody numerycznej mechaniki płynów (NMP) do wyznaczania fizycznych wielkości opisujących przepływ w zadanym układzie. Wyniki obliczeń NMP weryfikowane są poprzez badania znacznikowe. Metoda ta została zastosowana do badania mieszalników strumieniowych, rurociągów oraz hydrocyklonów klasyfikujących.

Laboratorium jest wyposażone w wysoko specjalistyczną unikatową aparaturę w tym mikroskopy konfokalne promieniowania X i promieniowania podczerwonego, wielozadaniowy rentgenowski spektrometr fluorescencyjny do mikro/makro analiz ultra śladowych stężeń pierwiastków.

MOLECULAR BIOPHYSICS AND BIOENERGETICS GROUP

Our research is focused on:

- electron transport in photosystem II and bacterial reaction centers;
- energy transfer in photosystems of type II;
- role of non-hem iron on the activity of type II photosystems;
- influence of cytochrme b_{559} on the activity of photosystem II;
- oxygen evolution in photosynthesis;
- structure, organization and physical/chemical properties of native and model dye-protein-lipid systems;
- protective and structural functions of carotenoids in native and model photosynthetic complexes;
- physical properties - topography, elasticity, adhesion forces - of normal and pathological cells and their organelles, and determination of the influence of selected stimuli on these properties in both cell types;
- mechanical properties of biopolymers and their influence on cell vital functions such as migration, proliferation and adhesion;
- influence of ionization radiation and metal ions on membrane stability of human erythrocytes;
- physical and chemical characterization of carbon nanotubes;

Applied experimental methods: absorption and fluorescence spectroscopy, fluorescence with double modulation, thermoluminescence, fast polarography, atomic force microscopy (AFM), Mössbauer spectroscopy.

Badania zespołu dotyczą:

- transportu elektronów w fotosystemie II i bakteryjnych centrach reakcji;
- transferu energii w obrębie fotosystemów typu II;
- wpływu żelaza niehemowego na aktywność strony akceptorowej fotosystemów typu II;
- wpływu cytochromu b_{559} na aktywność fotosystemu II;
- wydzielania tlenu w procesie fotosyntezy;
- struktury, organizacji i własności fizyko-chemicznych natywnych i modelowych układów barwnikowo-białkowo-lipidowych;
- funkcji strukturalnych i ochronnego działania karotenoidów w natywnych i modelowych kompleksach fotosyntetycznych;
- badania wpływu wybranych czynników na własności fizyczne – topografię, elastyczność i siły adhezji - niezmienionych i patologicznych komórek;
- analizy wpływu własności mechanicznych biopolimerów na funkcje życiowe kmórek, m.in. migrację, poliferację i adhezję;
- wpływu promieniowania jonizującego i jonów metali na stabilność błon erytrocytów;
- charakterystyki fizycznych i chemicznych własności nanorurek węglowych;

Stosowane metody badawcze: spektroskopia absorpcyjna i fluorescencyjna, fluorescencja o podwójnej modulacji, termoluminescencja, szybka polarografia, mikroskopia sił atomowych (AFM), spektroskopia mössbauerowska.

BIOMEDICAL IMAGING AND MODELING GROUP

The research activities of Biomedical Imaging and Modeling Group cover the subjects of Magnetic Resonance Imaging based on Nuclear Magnetic Resonance, optical imaging, modeling of physiological processes, nuclear medicine imaging and dosimetry in diagnostics and therapy with application of radioactive elements, application of advanced spectroscopic methods in biomedical research.

Działalność naukowa Zespołu Obrazowania i Modelowania obejmuje tematykę obrazowania magnetyczno-rezonansowego opartego o zjawisko magnetycznego rezonansu jądrowego, obrazowania optycznego, modelowania procesów fizjologicznych, obrazowania oraz dozymetrii w diagnostyce i terapii z wykorzystaniem izotopów promieniotwórczych w medycynie nuklearnej oraz wykorzystanie zaawansowanych metod spektroskopowych w badaniach biomedycznych.

MOESSBAUER SPECTROSCOPY GROUP

Our research interests encompassed two fields: (1) solid state physics, and (2) bio-pharmaceutical-medical physics. Our activities in the former were focused on (a) experimental and theoretical investigations of various physical properties, including Debye temperature, electronic structure, kinetics of transformation, formation energy, of the sigma-phase in Fe-X alloy systems (X=Cr, V, Mo, Re), by means of different experimental (e. g. Mössbauer Spectroscopy, Neutron Diffraction, Magnetometry, X-ray Diffraction) and theoretical (Korringa-Kohn-Rostoker Green's function) methods, and (b) short-range ordering in Fe-Cr alloys - caused by He-ions irradiation, phase decomposition – and the Fe-rich border of the miscibility gap Regarding the latter issue, we were interested in studying with the Mössbauer spectroscopy forms and dynamics of iron in various pharmaceutical approximants of ferritin (Imferon, Ferrum Lek and Maltofer®).

Program naszych badań obejmuje dwie dziedziny: (1) fizykę ciała stałego oraz (b) fizykę bio-farmaceutyczno-medyczną. W ramach (1) prowadzone były badania (a) różnych własności fizycznych fazy sigma takich jak: temperatura Debye'a, struktura electronowa, kinetyka i energia tworzenia się fazy σ, w układach Fe-X (X=Cr, V, Mo, Re) przy pomocy kilku metod eksperymentalnych (spektroskopia mössbauerowska,rozpraszanie neutronów, magnetometria, rozpraszanie promieniowania rentgenowskiego) oraz metody funkcji Greena, oraz (b) uporządkowania bliskiego zasięgu i granicy obszaru występowania tzw. *Miscibility gap* w stopach Fe-Cr poddanych napromieniowaniu jonami He oraz rozpadowi fazowemu. W ramach (2) badane były przy pomocy spektroskopii mössbauerowskiej formy i dynamika Fe w specyfikach farmaceutycznych uważanych za modele ferrytyny (Imferon, Ferrum Lek, Maltofer®) przy pomocy spektroskopii mössbauerowskiej.

ACHIEVEMENTS

BIOMEDICAL ENVIRONMENTAL RESEARCH GROUP

- The use of oxidation states and chemical environments of iron and zinc as potential indicators of brain tumour malignancy grade.
- Determination of variability of secondary structures of proteins and level of lipid saturation / unsaturation for dopaminergic nerve cells of senile brains.
- Preliminary determination of biomolecular composition of adrenal gland tumors.
- Application of statistical methods to source identification and apportionment of PM2.5 fraction.
- Application of phase tracing method to evaluation of turbulent diffusivity distribution in the entire flow field; simulation results verification by experimental tracer data.

- Wykorzystanie stopnia utlenienia i otoczenia chemicznego żelaza i cynku jako potencjalnych wskaźników stopnia złośliwości nowotworów mózgu.
- Oznaczenie zmienności form struktury drugorzędowej białek oraz stopnia nasycenia/nienasycenia lipidów w neuronach dopaminergicznych mózgów starczych.
- Wstępne oznaczenie składu biomolekularnego guzów nadnerczy.
- Zastosowanie metod statystycznych do identyfikacji źródeł zanieczyszczeń pyłowych PM2.5 oraz ich udziału w całkowitej masie.
- Zastosowanie metody fazy znaczonej do wyznaczenia rozkładu dyfuzji turbulentnej w polu przepływu; weryfikacja symulacji doświadczalnymi wynikami z badań znacznikowych.

MOLECULAR BIOPHYSICS AND BIOENERGETICS GROUP

- We reported for the first time that melanin significantly increases the stiffness of pigmented melanoma cells and that the effect depends on the amount of melanin inside the cells.
- We found that very low doses of neutron radiation (~ μSv) resulted in the membrane skeleton reorganization of red blood cells and in the change of their shape due to the Petkau effect. In addition, we observed that the oxygen release by hemoglobin in the irradiated erythrocytes is slowed down under low partial pressure of O_2.
- We showed that trituration of carboxylated multiwall carbon nanotubes (MWCNT) using a steel mill caused hydrogen ion release from -COOH groups and an enhanced COO^- reaction with iron enclosed in MWCNTs.

- Pokazaliśmy, po raz pierwszy, że melanina wpływa na wzrost sztywności upigmentowanych komórek melanomy. Efekt ten silnie zależy od ilości melaniny w komórkach.
- Zaobserwowaliśmy, że bardzo małe dawki (~ μSv) promieniowania neutronowego wywołują zmianę organizacji szkieletu błonowego czerwonych ciałek krwi oraz kształtu komórek w wyniku efektu Petkau. Ponadto, zauważyliśmy, że uwalnianie tlenu przez hemoglobinę w naświetlanych komórkach jest spowolnione w warunkach niskiego ciśnienia parcjalnego O_2.
- Pokazaliśmy, że rozdrabnianie karboksylowanych wielościennych nanorurek węglowych (MWCNTs) przy użyciu stalowego młyna powoduje uwolnienie jonów wodoru z grup -COOH i wzmożenie reakcji COO^- z żelazem zawartym w MWCNTs.

BIOMEDICAL IMAGING AND MODELING GROUP

- Optimalization of radiological exposing valuation for patients subjecting of short living radioisotopes therapy accomplished using the dedicated dosimetric phantom.
- The research aimed to optimalization of quantitative description of bilirubin kinetics during the extracorporeal liver therapy was conducted. The elaborated 2-compatment model decribing the elimination of bilirubin during the process of vicarious liver therapy was verified bsing on two clinical groups of patients.
- The solutions of set of Bloch's equations for NMR with fractional derivatives (Caputo type) were investigated using space of states and Adomian methods. The numerical simulations for selected set of parameters (Simulink, Runge-Kutta method) were performed to test the solutions.
- The exploatation of the „Cirrus 2 Open" imaging system was started. The investigations of the rabbit bones with biocompatible implants were performed nad the magnetic resonance images of implants with magnetic nanoparticles were made.
- The analysis of Vawelet and Curvelet transforms as the potential algorithm for nosie elimination and edges detection in tha magnetics resonace image was performer.
- The theoretical analysis of the Halbach type permanent magnets configuration in application to Magnetic Resonance Imaging was made, what is important for improvement of low field MRI systems. The motivation of this work is a possibility of magnets weight reduction, what could enable the application of such MRI system in the space station.

- Dokonano optymalizacji oceny narażenia radiologicznego pacjentów poddawanych terapii radioizotopami krótkożyciowymi, dzięki opracowaniu dedykowanego fantomu dozymetrycznego.
- Prowadzono badania z zastosowaniem modeli matematycznych w celu optymalizacji opisu ilościowego kinetyki bilirubiny podczas pozaustrojowej terapii wątroby. Opracowany 2-kompartmentowy model opisu usuwania bilirubiny podczas terapii zastępczej wątroby został zweryfikowany w oparciu o dwie grupy kliniczne.
- Przebadano rozwiązania układu równań Blocha o niecałkowitych pochodnych (pochodne typu Caputo) dla warunków NMR metodami przestrzeni stanów oraz metodą Adomiana. Wykonano także symulacje numeryczne (Simulink, metody Runge-Kutta)) dla wybranego zestawu parametrów.
- Rozpoczęto eksploatację systemu obrazowania „Cirrus 2 Open" uruchomionego w roku ubiegłym. Przeprowadzono badania kości królika z implantami biokompatybilnymi i wykonano techniką obrazowania magnetyczno-rezonansowego obrazy implantów domieszkowane nanocząstkami magnetycznymi.
- Przeprowadzono analizę transformaty falkowej i transformaty Curvelet jako algorytmu usuwania szumu i wykrywania krawędzi w obrazach magnetyczno-rezonansowych.
- Przeprowadzono analizę teoretyczną dotyczącą zastosowania konfiguracji magnesów trwałych typu Halbacha do obrazowania magnetyczno rezonansowego, co ma istotne znaczenie dla doskonalenia systemów niskopolowych. Motywacją do tych prac jest możliwość dużej redukcji masy magnesu, co umożliwiło by zastosowanie takiego systemu diagnostycznego na stacji kosmicznej.

- The study of the pathogenesis of epilepsy in the electrical kindling animal model of seizures was carried out. To realize the research purposes the elemental (using X-ray fluorescence spectroscopy) and biochemical (using FTIR microspectroscopy) changes occurring in the hippocampal formation as a result of repeated electrical stimulation were analyzed. The obtained results showed that among the phenomena responsible for lowering of the seizure threshold and appearance of spontaneous seizures in this animal model the mossy fibers sprouting should be taken into account.

- Prowadzono studia nad mechanizmami patogenezy padaczki w zwierzęcym modelu drgawek rozniecanych elektrycznie. W tym celu analizowano zmiany pierwiastkowe (przy użyciu rentgenowskiej mikroskopii fluorescencyjnej) i biochemiczne (przy użyciu mikrospektroskopii FTIR) zachodzące w formacji hipokampa na skutek wielokrotnej stymulacji elektrycznej. Uzyskane wyniki wykazały, że wśród zjawisk odpowiedzialnych za trwałe obniżenie progu pobudliwości drgawkowej i pojawienie się spontanicznych drgawek padaczkowych w tym modelu odpowiedzialne może być między innymi zjawisko kiełkowania włókien mszatych.

MOESSBAUER SPECTROSCOPY GROUP

- Experimental demonstration that the $\alpha \rightarrow \sigma$ phase transformation in equiatomic cold-rolled Fe-V alloys proceeds via an intermediate B2-phase.
- Experimental measurement and theoretical calculation of the electronic structure of the sigma-phase in the Fe-Mo alloys.
- Determination of the Fe-rich border of the miscibility gap and activation energy of a phase separation in Fe-Cr alloy system
- Calculation of the formation energy of the sigma-phase in the Fe-V alloy system
- Determination of the effect of heat treatments on the short-range order in Fe-Cr alloys

- Wykazanie na drodze eksperymentalnej, że transformacja $\alpha \rightarrow \sigma$ w kwazirównowagowych walcowanych na zimno stopach Fe-V zachodzi poprzez pośrednią fazę B2.
- Pomiar i obliczenia struktury elektronowej w stopach σ-FeMo.
- Wyznaczenie wartości rozpuszczalności chromu w żelazie oraz energii aktywacji procesu rozpadu fazowego w układzie Fe-Cr.
- Obliczenie energii tworzenia się fazy sigma w układzie Fe-V.
- Zbadanie wpływu obróbki termicznej stopów Fe-Cr na uporządkowanie bliskiego zasięgu.

ACTIVITY

K. BURDA

- A member of Scientific Committee at the Faculty of Physics and Applied Computer Science AGH
- A member of Scientific Council at Multidisciplinary School of Engineering in Biomedicine, AGH University of Science and Technology (since 2009)
- Head of the BIONAN consortium (since 2008)
- A member of Recall Committee of Privileges for PhD Students at the Faculty of Physics and Applied Computer Science AGH

- Członek Komisji d/s Nauki na Wydziale Fizyki i Informatyki Stosowanej AGH
- Członek Rady Programowej Międzywydziałowej Szkoły Inżynierii Biomedycznej AGH – Akademii Górniczo-Hutniczej (od 2009)
- Kierownik konsorcjum BIONAN (od 2008)
- Członek Odwoławczej Komisji Dyscyplinarnej dla Doktorantów na Wydziale Fizyki i Informatyki Stosowanej AGH

M. CZYŻYCKI

- Member of the European Microbeam Analysis Society (since 2009)
- Member of the European X-ray Spectrometry Association (since 2010)
- Reviewer for the “Nukleonika” journal

- Członek Europejskiego Towarzystwa Analizy Mikrowiązką (EMAS) (od 2009)
- Członek Europejskiego Stowarzyszenia Spektrometrii Promieniowania Rentgenowskiego (EXSA) (od 2010)
- Recenzent czasopisma „Nukleonika”

L. FURMAN

- Supervisor of students trainings for Technical Physics and Applied Computer Science
- Reviewer for the journals: Nukleonika, Computers & Chemical Engineering, Chemical Engineering and Processing: Process Intensification, Chemical Industry & Chemical Engineering Quarterly
- Coordinator in project "Fizyka – Twój wybór, Twoja przyszłość” for Technical Physics

- Pełnomocnik Dziekana ds. praktyk studenckich na kierunkach Fizyka Techniczna i Informatyka Stosowana, Wydziału Fizyki i Informatyki Stosowanej AGH
- Recenzent czasopism: Nukleonika, Computers & Chemical Engineering, Chemical Engineering and Processing: Process Intensification, Chemical Industry & Chemical Engineering Quarterly
- Koordynator projektu "Fizyka – Twój wybór, Twoja przyszłość” dla Fizyki Technicznej

Z. MATUSZAK

- President of Cracow Branch of the Polish Biophysical Society

- Prezes Krakowskiego Oddziału Polskiego Towarzystwa Biofizycznego

M. LANKOSZ

- Member of X-Ray Spectrometry Advisory Board (since 2008)
- Member of Scientific Council of the Institute of Nuclear Chemistry and Technology (since 2002)
- Member Committee of Nuclear Technology at the National Atomic Energy Agency (since 2009)
- Member of Editorial Board of „Nukleonika" (since 2010)
- Co-chairmen of the International Conference on Development and Applications of Nuclear Technologies NUTECH-2014

- Członek Komitetu Doradczego czasopisma X-Ray Spectrometry (od 2008)
- Członek Rady Naukowej Instytutu Chemii I Techniki Jądrowej (od 2002)
- Członek Komitetu Technologie Jądrowe przy Państwowej Agencji Atomistyki
- Członek Komitetu Redakcyjnego czasopisma "Nukleonika" (od 2010)
- Członek Zespołu interdyscyplinarnego do spraw Programu wspierania infrastruktury badawczej w ramach Funduszu Nauki i Technologii Polskiej
- Współprzewodniczący Międzynarodowej Konferencji Rozwój i Zastosowania Technologii Jądrowych NUTECH-2014

A. ORZECHOWSKA

- A member of National Qualification Framework for specialization of Medical Physics at the Faculty of Physics and Applied Computer Science AGH
- A member of Enrolment Committee at the Faculty of Physics and Applied Computer Science, AGH

- Członek zespołu ds. wdrażania Krajowych Ram Kwalifikacji Kształcenia dla kierunku „Fizyka medyczna" na Wydziale Fizyki i Informatyki Stosowanej AGH
- Członek Wydziałowej Komisji Rekrutacyjnej na Wydziale Fizyki i Informatyki Stosowanej AGH

L. SAMEK

- Member of Editorial Board of "European Journal of Environmental Sciences" (since 2012)
- A member of Enrolment Committee at the Faculty of Physics and Applied Computer Science, AGH
- Reviewer for X-ray Spectrometry, Analytica Chimica Acta, Science of the Total Environment, Aerosol and Air Quality Research

- Członek Komitetu Redakcyjnego czasopisma "European Journal of Environmental Sciences" (od 2012)
- Członek Wydziałowej Komisji Rekrutacyjnej na Wydziale Fizyki I Informatyki Stosowanej AGH
- Recenzent czasopism X-ray Spectrometry, Analytica Chimica Acta, Science of the Total Environment, Aerosol and Air Quality Research

Z. STĘGOWSKI

- Member of Editorial Board – Nucleonic Bulletin
- Member of International Scientific Committee of the Seventh International Conference on Tracers and Tracing Methods, Marrakech, Morocco
- Reviewer for the journals: Applied Radiation and Isotopes, Powder Technology

- Członek Komitetu Redakcyjnego Biuletynu Nukleonicznego
- Członek komitetu naukowego konferencji "Seventh International Conference on Tracers and Tracing Methods", Marrakech, Morocco
- Recenzent czasopism: Applied Radiation and Isotopes, Powder Technology

H. FIGIEL

- Członek Zarządu Głównego Polskiego Towarzystwa Fizycznego
- Przewodniczący Komisji Rewizyjnej Polskiego Stowarzyszenia Wodoru i Ogniw Paliwowych
- Przewodniczący Rady Konsorcjum BIOMAR
- Członek Rady Programowej Międzywydziałowej Szkoły Inżynierii Biomedycznej AGH
- Członek Międzynarodowego Komitetu Koordynacyjnego Międzynarodowych Sympozjów Układów Metal- Wodór
- Sekretarz Oddziału Krakowskiego Societas Humboldtiana Polonorum,
- Ekspert Polskiej Komisji Akredytacyjnej w dziedzinie Fizyki

- Member of the Main Board of the Polish Physical Society
- Chairman of the Auditorial Comission of the Polish Fuel Cell and Hydrogen Association
- Chairman of the board of BIOMAR Consortium
- Member of the Program Board of the Inter-Faculty School of Biomedical Engineering at AGH
- Member of International Steering Committee of the International Symposia on Metal Hydrogen Systems
- Secretary of the Krakow Branch of the Societas Humboldtiana Polonorum
- Expert in physics of the Polish Accreditation Committee

A. JUNG

- Vice Chairman of the Krakow Branch of the Polish Society of Medical Physics
- Coordinator for Medical Physics field in the project "Now physics. New forms of education closer to employers”
- Member of the unit preparing the Accreditation for the Medical Physics
- Supervisor of the students trainings at the Inter-Faculty School of Biomedical Engineering at AGH

- Zastępca Przewodniczącego Oddziału Krakowskiego Polskiego Towarzystwa Fizyki Medycznej
- Koordynator ds. Kierunku Fizyka Medyczna projektu “Teraz Fizyka. Nowe formy kształcenia bliżej pracodawcy”
- Członek zespołu ds. przygotowania akredytacji dla kierunku Fizyka Medyczna
- Opiekun praktyk studenckich dla Międzywydziałowej Szkoły Inżynierii Biomedycznej

K. MATUSIAK

- Chairman of the Unit for National Qualification Frame Introduction for Medical Physics Course
- Member of the unit preparing the Accreditation for the Medical Physics
- Member of the unit for teaching quality at the Faculty of Physics and Applied Computer Science

- Przewodnicząca zespołu ds. Wdrażania Krajowych Ram Kwalifikacji dla kierunku Fizyka Medyczna
- Członek zespołu ds. przygotowania akredytacji dla kierunku Fizyka Medyczna
- Członek zespołu ds. Jakości Kształcenia na Wydziale Fizyki i Informatyki Stosowanej AGH

J. CHWIEJ

- Member of the Young Researcher Council by the Ministry of Science and Higher Education

- Członek Rady Młodych Naukowców powołanej przez Ministra Nauki i Szkolnictwa Wyższego

S. M. DUBIEL

- Member of the University's Senate Commission for Discipline of Students
- Fellow of the Institute of Physics, London (since 2002)
- Member of the Mössbauer Century Club, USA (since 2005)
- Member of the Research Board of Advisors of The American Biographical Institute (since 2005)
- Panel Member for Fellows at the Institute of Physics (IOP), London
- Reviewer for Intermetallics, Journal of Physics and Chemistry of Solids, Nukleonika, Physica Status Solidi (b)
- Member of the Editorial Board for Applied Sciences

- Członek Senackiej Komisji ds. Dyscyplinarmych Studentów
- Członek Instytutu Fizyki w Londynie w randze Fellow
- Członek Mössbauer Century Club, USA
- Członek Komitetu Doradczego Amerykańskiego Instytutu Biograficznego (ABI)
- Członek Komisji ds. Fellows w Instytucie Fizyki w Londynie (IOP)
- Recenzent czasopism Intermetallics, Journal of Physics and Chemistry of Solids, Nukleonika, Physica Status Solidi (b)
- Członek Komitetu Redakcyjnego czasopisma Applied Sciences

J. DUDAŁA

- Secretary of the Krakow Branch of the Polish Society of Medical Physics
- A member of Enrolment Committee at the Faculty of Physics and Applied Computer Science, AGH
- Member of the unit for teaching quality at the Faculty of Physics and Applied Computer Science, AGH
- Assistant Radiation Protection Supervisor at the Faculty of Physics and Applied Computer Science

- Sekretarz Oddziału Krakowskiego Polskiego Towarzystwa Fizyki Medycznej
- Członek Wydziałowej Komisji Rekrutacyjnej na Wydziale Fizyki I Informatyki Stosowanej AGH
- Członek zespołu ds. Jakości Kształcenia na Wydziale Fizyki i Informatyki Stosowanej AGH
- Zastępca Wydziałowego Inspektora Ochrony Radiologicznej

M. SZCZERBOWSKA-BORUCHOWSKA

- Dean's Plenipotentiary for Quality of Education
- Team Coordinator for the accreditation of Medical Physics study

- Pełnomocnik Dziekana ds. Jakości Kształcenia
- Przewodniczący zespołu ds. przygotowania akredytacji na kierunku Fizyka Medyczna

Department of Condensed Matter Physics
Katedra Fizyki Materii Skondensowanej

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prof. dr hab.Stanisław Kaprzyk full professor
prof. dr hab. inż. Wojciech Łużny full professor.
prof. dr hab. Wiesława Sikora full professor
prof. dr hab. Janusz Wolny full professor
prof. dr hab. inż. Janusz Toboła associate professor
prof. dr hab. inż. Andrzej Zięba associate professor.
dr hab. inż. Andrzej Baczmański associate professor.
dr hab. inż. Jacek Tarasiuk associate professor.
dr hab. inż. Andrzej Bernasik associate professor
dr inż. Paweł Armatys assistant professor
dr inż. Jakub Haberko assistant professor
dr inż.Jan Kulka assistant professor
drJacek Nizioł assistant professor
dr Lucjan Pytlik assistant professor
dr inż. Maciej Śniechowski assistant professor
dr inż. Bartłomiej Wiendlocha assistant professor
dr inż. Sebastian Wroński assistant professor
dr inż. Roman Wawszczak teaching assistant
dr inż. Paweł Kuczera teaching assistant
dr inż. Marianna Marciszko teaching assistant
dr inż. Marcin Wroński teaching assistant
Władysław Błaszczyk
Ryszard Skotnicki

PROFILE

Scientific activities of the Department are mainly focused on the following topics:

- Properties and symmetry analysis of selected phases of ordered structures
- Studies of aperiodic structures
- Deformation, recrystallization and internal stresses in polycrystalline materials
- Electron structure of the solid state
- Polymer research
- Theory of measurement uncertainty

Działalność naukowa Katedry koncentruje się na następujących zagadnieniach:

- Własności i analiza symetryczna wybranych faz struktur uporządkowanych
- Badanie struktur aperiodycznych
- Odkształcenia, rekrystalizacja oraz naprężenia wewnętrzne w materiałach polikrystalicznych
- Struktura elektronowa ciał stałych
- Badanie polimerów
- Teoria niepewności pomiarów

ACHIEVEMENTS

- Edition of the book:Andrzej Zięba, Analiza danych w naukach ścisłych i technice, PWN, Warszawa, 2013 (ISBN: 978-83-01-17303-6).
- Determination of stress distribution between phases and mechanical properties of the individual phases in duplex stainless steel and pearlitic steel.
- Application of the synchrotron radiation for diffraction measurements of stresses in surface layers of polycrystalline materials.
- Examination of the mechanisms and simple explanation of the appearance of two types of rolling texture in f.c.c. metals.
- Clarification of the impact of asymmetric rolling on the microstructure and texture of titanium and aluminum.
- Development of the method for analyzing of bone trabecula growth into polymer scaffold.
- Explanation of high efficiency of thermoelectric conversion in *n*-doped $Mg_2Si_{1-x}Sn_x$ semiconducting systems as resulted from the convergence of the electron conduction bands.
- Theoretical study of the effect of the resonant-like impurity Tl in the PbTe matrix on electron transport properties.
- Investigation of real space structure factor and of scaling factor for quasicrystals.
- Observation of the net electric dipole moments reorientation at poly(methyl methacrylate) /gold interface modified by self assembled monolayers terminated with carboxyl group that can be attributed to the inter-association and depolarization effects between the polymer and the SAM caused by hydrogen bonds.

- Wydanie książki: Andrzej Zięba, Analiza danych w naukach ścisłych i technice, PWN, Warszawa, 2013 (ISBN: 978-83-01-17303-6).
- Wyznaczenie rozkładu naprężeń miedzy fazami oraz własności mechanicznych poszczególnych faz w nierdzewnej stali dwufazowej oraz w stali perlitycznej.
- Zastosowanie promieniowania synchrotronowego do dyfrakcyjnych pomiarów naprężeń w warstwach powierzchniowych materiałów polikrystalicznych.
- Zbadanie mechanizmów oraz proste wyjaśnienie powstawania dwóch typów tekstur walcowania metali o strukturze regularnej ściennie centrowanej.
- Wyjaśnienie wpływu walcowania asymetrycznego na mikrostrukturę i teksturę tytanu i aluminium.
- Opracowanie metody analizy wrastania beleczek kostnych w strukturę polimerowego implantu.
- Wyjaśnienie dużej sprawności konwersji termoelektrycznej *n*-domieszkowanych układów półprzewodzących $Mg_2Si_{1-x}Sn_x$ w oparciu o mechanizm konwergencji elektronowych pasm przewodnictwa.
- Teoretyczne badania wpływu domieszki rezonansowej Tl w matrycy PbTe na elektronowe własności transportowe.
- Badanie czynnika strukturalnego w przestrzeni rzeczywistej i czynnika skalowania dla kwazikryształów.
- Obserwacja zmiany orientacji elektrycznego momentu dipolowego powstałego na granicy poli(metakrylanem metylu) a złotem modyfikowanej warstwą samoorganizującą się zakończoną grupą karboksylową co jest wynikiem efektów asocjacji i depolaryzacji wiązań wodorowych pomiędzy polimerem a warstwą samoorganizującą się.

- Investigation of possible BH_4 rotations and ordering of their principal axes in metal borohydrides by tensor type symmetry analysis.

- Badanie możliwości rotacji klastrów BH_4 i uporządkowania ich osi swobodnych w borowodorkach metali za pomocą analizy symetrycznej typu tensorowego.

ACTIVITY

A. BACZMAŃSKI

- Member of Scientific Committees of International Conferences: "European Conference on Residual Stresses (ECRS)" and "Size-Strain Conference"
- Reviewer of : Journal of Composite Materials, Scripta Materialia

- Członek Komitetów Naukowych Międzynarodowych Konferencji: European Conference on "Residual Stresses (ECRS)" oraz "Size-Strain oraz Size and Strain"
- Recenzent czasopism: Journal of Composite Materials, Scripta Materialia

W. ŁUŻNY

- Member of Intern. Advisory Board of Int. Conference on X-Ray Investigations of Polymer Structure (XIPS),
- Expert of National Science Centre, panel ST5 "Materials and synthesis",
- Member of the Senate of AGH University of Science and Technology,
- Chairman of the AGH Senate Committee for Budget,
- Member of the Scientific Committee of M. Smoluchowski Scientific Consortium "Matter-Energy-Future" (KNOW),
- Member of the Commission for the future employment of assistant professors.

- Członek: Intern. Advisory Board of Int. Conference on X-Ray Investigations of Polymer Structure (XIPS),
- Ekspert Narodowego Centrum Nauki w panelu ST5 "Synteza i materiały"
- Senator AGH,
- Przewodniczący Senackiej Komisji ds. Budżetu,
- Członek Rady Naukowej Krakowskiego Konsorcjum Naukowego im. M. Smoluchowskiego „Materia – Energia – Przyszłość" (KNOW),
- Członek Wydziałowej Komisji ds. rotacji adiunktów.

W. SIKORA

- Member of Committee of Crystallography, Polish Academy of Science,
- Member of Commission on Magnetic Structures of the International Union of Crystallography,
- Member of Polish Society of Neutron Diffraction,
- Member of 2014 IUCr International Program Committee.

- Członek Komitetu Krystalografii Polskiej Akademii Nauk,
- Członek Komisji Struktur Magnetycznych Międzynarodowej Unii Krystalograficznej,
- Członek Polskiego Towarzystwa Rozpraszania Neutronów,
- Członek 2014 IUCr International Program Committee.

J. TARASIUK

- Rector's representative for Quality of Teaching,
- Member of the jury of the competition under the patronage of the Rector: Lecture Notes in the Internet,
- Referee of the projects of National Science Centre (NCN).
- Member of the Programme Centre for Distance Education at AGH.

- Pełnomocnik Rektora ds. Jakości Kształcenia,
- Członek jury konkursu pod patronatem JM Rektora Notatki w Internecie.
- Recenzent projektów Narodowego Centrum Nauki (NCN).
- Członek Rady Programowej Ośrodka Edukacji Niestacjonarnej AGH.

J. TOBOŁA

- Reviewer of Physical Review Letters & Physical Review B
- Member of International Scientific Committees of ECT Conferences by European Thermo-Electrical Society,
- member of European Thermoelectric Society Board (since 2008)
- Member of International Advisory Board of the International Conference on Thermoelectrics, Kobe, Japan (2013) .
- Referee of the projects of National Science Centre (NCN).

- Stały recenzent APS (American Physical Society) czasopism Physical Review Letters & Physical Review B.
- Członek międzynarodowych komitetów naukowych organizujących konferencje: ECT Europejskiego Towarzystwa Termoelektrycznego
- Członek European Thermoelectric Society Board (od 2008)
- Członek międzynarodowego komitetu konferencji: Thermoelectrics, Kobe, Japonia (2013)
- Recenzent projektów Narodowego Centrum Nauki (NCN).

K. WIERZBANOWSKI

- Head of the Department of Condensed Matter Physics,
- Chairman of the Board IV for Scientific Research of AGH University of Science and Technology,
- Member of International Scientific Committees of Conferences on: Mechanical Stress Evaluation by Neutrons and Synchrotron Radiation (MECA SENS),
- Member of the evaluation committee for measurement projects in L.L.B. Saclay, France ('la Table Ronde') ,
- Member of Board of Reviewers: Archives of Metallurgy and Materials,
- Reeferee of American Physical Society for journals: Phys. Review Letters and Physical Review B.

- Kierownik Katedry Fizyki Materii Skondensowanej,
- Przewodniczący Zespołu IV Badań Naukowych AGH,
- Członek międzynarodowych komitetów naukowych organizujących konferencje z cyklu: Mechanical Stress Evaluation by Neutrons and Synchrotron Radiation (MECA SENS),
- Członek komitetu ewaluacyjnego projektów pomiarowych w L.L.B. Saclay, Francja ('la Table Ronde') ,
- Członek komitetu recenzentów czasopisma Archives of Metallurgy and Materials ,
- Recenzent American Physical Society do czasopism: Phys. Review Letters oraz Physical Review B.

J. WOLNY

- Dean of the Faculty of Physics and Applied Computer Science,
- Member of the Senate of AGH University of Science and Technology
- Member of Committee of Crystallography, Polish Academy of Science,
- Organizer of International Conference on Quasicrystals (ICQ12), Kraków, 1-6 September 2013.

- Dziekan Wydziału Fizyki I Informatyki Stosowanej,
- Senator AGH,
- Członek Komitetu Krystalografii Polskiej Akademii Nauk.
- Organizator konferencji: International Conference on Quasicrystals (ICQ12), Kraków, 1-6 września 2013.

A. ZIĘBA

- Chairman of University Group for Didactic Audit,
- Polish Physical Society: belongs to Main Board and member of Commission for Rewards and Distinctions,
- Reviewer of Metrology and Measurement Systems, and Pomiary, Automatyka Kontrola,
- Scientific supervisor of the Undergraduate Student Laboratory.

- Przewodniczący Uczelnianego Zespołu Audytu Dydaktycznego,
- Polskie Towarzystwo Fizyczne: należy do Zarządu Głównego oraz członek Komisji Nagród i Wyróżnień,
- Recenzent Metrology and Measurement Systems, oraz Pomiary, Automatyka Kontrola,
- Opiekun naukowy studenckiej Pracowni Fizycznej.

Department of Applied Informatics and Computational Physics
Katedra Informatyki Stosowanej i Fizyki Komputerowej

STAFF

HEAD

prof. dr hab. Krzysztof Kułakowski, full professor

COMPLEX SYSTEMS GROUP
ZESPÓŁ UKŁADÓW ZŁOŻONYCH

prof. dr hab. Krzysztof Kułakowski, full professor
prof. dr hab. inż. Zbigniew Kąkol, full professor (till 01.10.2013)
dr hab. Andrzej Lenda, associate professor
dr inż. Antoni Dydejczyk, assistant professor
dr inż. Przemysław Gawroński, assistant professor
dr inż. Piotr Gronek, assistant professor
dr inż. Małgorzata Krawczyk, assistant professor
dr inż. Krzysztof Malarz, assistant professor
dr inż. Maciej Wołoszyn, assistant professor
dr inż. Barbara Kawecka-Magiera, senior lecturer
dr inż. Grażyna Krupińska, senior lecturer
dr inż. Janusz Malinowski, senior lecturer

NANOSTRUCTURES AND NANODEVICES THEORY GROUP
ZESPÓŁ TEORII NANOSTRUKTUR I NANOURZĄDZEŃ

prof. dr hab. Stanisław Bednarek, full professor
prof. dr hab. Janusz Adamowski, full professor
prof. dr hab. inż. Bartłomiej Szafran, associate professor
dr inż. Tomasz Chwiej, assistant professor
dr inż. Bartłomiej Spisak, assistant professor
dr. inż. Michał Nowak, teaching assistant
dr. inż. Paweł Szumniak, teaching assistant
dr. inz. Pawel Wójcik, teaching assistant

BIOMETRIC GROUP
ZESPÓŁ BIOMETRII

dr hab. inż. Saeed Khalid, associate professor
mgr inż. Krzysztof Misztal, teaching assistant
mgr inż. Adam Szczepański, teaching assistant

PROFILE

COMPLEX SYSTEMS GROUP

Research is conducted in a few threads; below the topics are mentioned which are concentrated in the Complex Systems Group. One of them is connected with the collaboration with laboratories of material sciece at the Universidad del Pais Vasco, San Sebastian, and Instituto de Ciencia de Materiales de Madrid, CSIC. In particular, we are modeling hysteresis loops in micro- and nanoscopic systems. Other directions of research deal with modeling sociological processes in general frames of game theory and with statistical mechanics of complex networks. A separate group of research issues is due to quantum theory of nanoscopic systems, developed by prof. Józef Spałek.

Badania prowadzone są w kilku kierunkach; wymieniamy tu tematy skoncentrowane w Zespole Układów Złożonych. Jeden z tych kierunków wiąże się z współpracą z laboratoriach fizyki materiałowej na Universidad del Pais Vasco, San Sebastian, i w Instituto de Ciencia de Materiales de Madrid, CSIC. Modelowane są m. in. pętle histerezy układów mikro- i nanoskopowych. Inne kierunki badań to modelowanie procesów społecznych w ramach szeroko pojętej teorii gier oraz mechanika statystyczna sieci złożonych. Osobną grupą tematów jest kwantowa teoria układów nanoskopowych, rozwijana przez prof. Józefa Spałka.

NANOSTRUCTURES AND NANODEVICES THEORY GROUP

- theory of electronic properties of quantum dots
- computer simulations of qubits and logic gates in nanodevices
- theory of electron quantum transport in quantum wells and nanowires
- modeling spin-orbit coupling effects in quantum dot
- simulation of electron spin transport through resonant tunnelling diodes and quantum rings
- investigation of the conductivity in quantum rings
- superconductivity in metallic nanostructures

- teoria elektronowych własności kropek kwantowych
- symulacje komputerowe kubitów i bramek logicznych w nanourządzeniach
- teoria kwantowego transportu elektronów w studniach i drutach kwantowych
- modelowanie oddziaływania spin-orbita w kropkach kwantowych
- symulacja transportu spinu w rezonansowych diodach tunelowych i pierścieniach kwantowych.
- badanie przewodnictwa elektronowego pierścieni kwantowych
- nadprzewodnictwo w metalicznych strukturach niskowymiarowych

BIOMETRIC GROUP

The scientific interests of the Group include:

- Automatic verification of human identity
- Automatic techniques of human recognition
- Analysis and processing of digital images and signals
- New diagnostic techniques in medicine

During 2013 the group conducted many new studies in this field, including development of iris and retina recognition and verification algorithms, face anatomy studies, oxidation and ECG signal analysis.

The group also secured funding for creation of biometrical research laboratory which is currently pending and successfully prepared 12th edition of International Conference on Computer Information Systems and Industrial Management Applications (CISIM) which took place in Cracow in September.

The group also promotes the idea of the use of biometrics solutions in everyday life to improve the public safety and quality of life which lead to an idea of the new course for students - "Biometrics in mobile devices" where students will learn how to combine modern technologies with recent discoveries in the field of biometrics to enhance human existence.

Zainteresowania naukowe grupy obejmują:

- Automatyczną weryfikację tożsamości człowieka
- Techniki automatycznego rozpoznawania ludzi
- Analizę i przetwarzanie obrazów i sygnałów cyfrowych
- Nowe metody diagnostyczne w medycynie

W 2013 roku zespół koncentrował się na badaniach nad rozpoznawaniem oraz weryfikacją ludzi na bazie tęczówki oraz siatkówki, opracowaniem nowych algorytmów śledzących anatomię i mimikę twarzy oraz analizą sygnałów oksymetrycznych i EKG.

Udało się również zabezpieczyć finansowanie wyposażenia laboratorium do prowadzenia zajęć z biometrii. Kompletowanie niezbędnego wyposażenia jest obecnie w toku. Zespół miał również zaszczyt odpowiadać za przeprowadzenie 12-tej edycji International Conference on Computer Information Systems and Industrial Management Applications (CISIM), która to odbyła się w Krakowie we wrześniu.

Jako zespół staramy się również promować zastosowania biometryczne w codziennym życiu w celu poprawy bezpieczeństwa publicznego i jakości życia ludzkiego. W tym celu rozpoczynamy kurs dla studentów - "Biometria w urządzeniach mobilnych", podczas którego studenci nauczą się jak połączyć nowoczesne technologie z najnowszymi odkryciami w dziedzinie biometrii w celu poprawy jakości ludzkiej egzystencji.

ACHIEVEMENTS

COMPLEX SYSTEMS GROUP

- Calculations of magnetic hysteresis for systems of interacting microwires
- Simulations of irreversible processes in systems of ferromagnetic nanowires
- New applications of symmetry induced compression of phase space for circular molecules
- Simulations of competing contact processes in networks
- Simulations of dynamics of systems of robots
- Design of a cellular automaton for simulations of traffic jams

- Obliczenia histerezy magnetycznej dla układów oddziałujących mikrodrutów
- Symulacje procesów nieodwracalnych w układach nanodrutów ferromagnetycznych
- Nowe zastosowania kompresji przestrzeni stanów dla molekuł kołowych
- Symulacje konkurencyjnych procesów kontaktowych w sieciach
- Symulacje dynamiki układów robotów
- Konstrukcja automatu komórkowego do symulacji zatorów ruchu drogowego

NANOSTRUCTURES AND NANODEVICES THEORY GROUP

- Description of confined states in quantum dots defined within finite flakes of bilayer graphene.
- Solving the problem of electron transport through a quantum point contact with spin-orbit interaction within the Landauer approach.
- Description of the spin-polarization anisotropy in a narrow spin-orbit-coupled nanowire quantum dot.
- Theoretical description of spin filter effect at room temperature in GaN/GaMnN ferromagnetic resonant tunneling diode
- Spin-Orbit-Mediated Manipulation of Heavy-Hole Spin Qubits in Gated Semiconduc-tor Nanodevices

- Opis stanów związanych w kropkach kwantowych indukowanych w dwuwarstwowym grafenie.
- Rozwiązanie problemu transportu elektronowego przez kwantowy kontakt punktowy z oddziaływaniem spin-orbita w ramach podejścia Landauera.
- Opis spowodowanej przez oddziaływanie spin-orbita.anizotropii właściwości spinowych kropek kwantowych indukowanych w nanodrutach.
- Przebadanie efektu polaryzacji spinowej prądu w temperaturach pokojowych w ferromagnetycznych diodach tunelowych zbudowanych na bazie GaN/GaMnN
- Wykorzystanie oddziaływania spin-orbita do wykonywania operacji na spinie ciężkiej dziury w elektrostatycznych kropkach kwantowych.

BIOMETRIC GROUP

- Optimization of K3M thinning algorithm
- New approaches to face recognition
- Application of new approach to face recognition
- CISIM 2013 organization
- Acquisition of the second grant of Motorola Solutions Foundation

- Zastosowanie nowych podejść do rozpoznawania twarzy
- Rozwinięcie algorytmów identyfikacji tęczówki
- Organizacja CISIM 2013
- Zdobycie drugiego grantu Motorola Solutions Foundation

ACTIVITY

J. ADAMOWSKI

- director of the Interdisciplinary PhD Study
- member of the Committee for Ethics of AGH University of Science and Technology
- member of the Programme Committee of the Laboratory for Physical Fundamentals of Information Processing
- referee of scientific journals: Physical Review Letters, Physical Review and others

- kierownik Interdyscyplinarnych Studiów Doktoranckich
- członek Komisji Etyki AGH
- członek Rady Programowej Laboratorium Fizycznych Podstaw Przetwarzania Infor-macji
- recenzent czasopism naukowych: Physical Review Letters, Physical Review i innych

S. BEDNAREK

- member of the Physics Committee of the Polish Academy of Sciences
- member of Editorial Advisory Board, The Open Nanomedicine Journal
- referee of scientific journals: Physical Review Letters, Physical Review B etc.

- członek Komitetu Fizyki PAN
- członek Redakcyjnego Komitetu doradczego czasopisma The Open Nanomedicine Journal
- recenzent czasopism naukowych: Physical Review Letters, Physical Review B i innych.

P. GAWROŃSKI

- Referee of scientific journal: Journal of Magnetism and Magnetic Materials

- Recenzent czasopisma naukowego: Journal of Magnetism and Magnetic Materials

Z. KĄKOL

- Vice Rector of AGH-UST for Science
- Member of Jury of the Małopolska Grant Foundation „Sapere Auso”
- Member of Board of the Engel Family Foundation
- Member of Jury of Prizes of the City of Cracow

- Prorektor AGH ds. Nauki;
- Jury Małopolskiej Fundacji Stypendialnej „Sapere Auso”;
- Zarząd Fundacji Rodziny Engelów
- Komisja nagród Miasta Krakowa

M. J. KRAWCZYK

- Referee of scientific journal: European Physical Journal B, Physica A

- Recenzent czasopisma naukowego: European Physical Journal B, Physica A

K. KUŁAKOWSKI

- Referee of scientific journals: Phys. Rev. E, PLOS ONE
- Member of Committee of Complex Systems in the Polish Academy of Arts and Sciences

- Recenzent czasopism naukowych: Phys. Rev. E, PLOS ONE
- Członek Komisji Układów Złożonych PAU

A. LENDA

- Coordinator of International Contacts for Students of AGH-UST

- Koordynator Praktyk Zagranicznych Studentów AGH

K. MALARZ

- Managing Editor, Central European Journal of Physics (since 2006)
- Editor, International Journal of Statistical Mechanic (since 2013)
- Editor, The Scientific World Journal: Computer Science (since 2013)
- Member at the Ministry of Science and Higher Education, Group for Sciences and Engineering to assess applications for funds for statutory activity (since 2011)
- Member of the Auditorial Commission for Section of Physics in Economy and Social Sciences, Polish Physical Society (since 2009)
- Referee of scientific journals: Physical Review Letters, Physical Review E, Physica A: Statistical Mechanics and its Applications, The Physical European Journal B, International Journal of Modern Physics C, Journal of Artificial Societies and Social Simulation, Computer Physics Communications, Physica D: Nonlinear Physics, Modern Physics Letters B
- Member of the Teaching Auditorial Group at the faculty (since 2013)

- Redaktor Central European Journal of Physics (od 2006)
- Redaktor International Journal of Statistical Mechanic (od 2013)
- Redaktor The Scientific World Journal: Computer Science (od 2013)
- Członek Zespołu Specjalistycznego Nauk Technicznych i Ścisłych (ZS-3) do oceny wniosków o przyznanie środków finansowych na działalność statutową, MNiSzW (od 2011)
- Członek Komisji Rewizyjnej Sekcji Fizyki w Ekonomii i Naukach Społecznych Polskiego Towarzystwa Fizycznego (od 2009)
- Recenzent czasopism naukowych: Physical Review Letters, Physical Review E, Physica A: Statistical Mechanics and its Applications, The Physical European Journal B, Journal of Artificial Societies and Social Simulation, Computer Physics Communications, Physica D: Nonlinear Physics, Modern Physics Letters B
- Członek wydziałowego Zespołu Audytu Dydaktycznego (od 2013)

K. SAEED

- Editor-in-Chief, International Journal of Biometrics (since 2007) Publishers: Inderscience, UK
- Conference General Chair, Computer Information Systems and Industrial Management - CISIM 2013 – Springer LNCS 8104, September 25-27, 2013, Kraków, Polska,
- IEEE Computer Society Senior Member; 2011-2013 nominated for IEEE CS DVP Distinguished Visitor Program
- Naczelny Redaktor International Journal on Computer Information Systems and Industrial Management Applications (od 2008)
- Naczelny Redaktor International Journal of Bio-metrics (od 2007)
- Przewodniczący Komitetu Naukowego Konferencji Computer Information Systems and Industrial Management - CISIM 2013 – Springer LNCS 8104, September 25-27, 2013, Kraków, Poland
- Członek IEEE Computer Society; nominowany do programu Distinguished Visitor Program na lata 2011-13

J. SPAŁEK

- Head of the Condensed Matter Theory and Nanophysics Department, Marian Smoluchowski Institute of Physics, Jagiellonian University, Kraków
- Head of the research line in Academic Centre of Materials and Nanotechnology (ACMIN) AGH, Kraków
- Member of the Editorial Board Acta Physica Polonica A
- Referee for scientific journals: The Physical Review Letters, The Physical Review B, The European Physical Journal B, Journal of Physics: Condensed Matter, Journal of Physics A: Mathematical and General, Physica Scripta, Acta Physica Polonica A and B, New Journal of Physics, Nature Physics
- Foreign Member of the Accademia di Scienze e Lettere, Milano (Italy), from 2006
- Referee of the scientific projects for the National Science Centre (Kraków), Foundation for Polish Science (Warszawa), and for foreign funding agencies
- Member, Commission on Complex Systems, Polish Academy of Arts and Sciences, Kraków
- Kierownik Zakładu Teorii Materii Skondensowanej i Nanofizyki, Instytut Fizyki im. Mariana Smoluchowskiego, Uniwersytet Jagielloński
- Kierownik linii badawczej Akademickiego Centrum Materiałów i Nanotechnologii (ACMIN) AGH, Kraków
- Członek Rady Redakcyjnej Acta Physica Polonica A
- Recenzent w czasopismach naukowych: The Physical Review Letters, The Physical Review B, The European Physical Journal B, Journal of Physics: Condensed Matter, Journal of Physics A: Mathematical and General, Physica Scripta, Acta Physica Polonica A oraz B, New Journal of Physics, Nature Physics
- Członek zagraniczny oddziału lombardzkiego Włoskiej Akademii Nauk, z siedzibą w Mediolanie, od 2006 r.
- Recenzent wniosków grantowych: Narodowe Centrum Nauki (NCN), Fundacja na rzecz Nauki Polskiej (FNP) i dla zagranicznych agencji naukowych
- Członek Komisji Układów Złożonych, Polska Akademia Umiejętności, Kraków

B. SZAFRAN

- coordinator of Krakow Interdisciplinary PhD Programme in Nanoscience and Ad-vanced Nanostructures,
- editor in Central European Journal of Physics
- referee of scientific journals: Physical Review Letters, Physical Review B, Applied Physics Letters, Journal of Applied Physics, Nanotechnology, Journal of Physics Condensed Matter etc.
- Deputy Dean for Science and Cooperation, Faculty of Physics and Applied Computer Science AGH

- koordynator programu Krakow Interdisciplinary PhD Programme in Nanoscience and Advanced Nanostructures finansowanego za pośrednictwem Fundacji na rzecz Nauki Polskiej z funduszy strukturalnych
- edytor w Central European Journal of Physics
- recenzent we wszystkich znanych czasopismach z zakresu fizyki ciała stałego oraz w Physical Review Letters i Nanotechnology
- Prodziekan ds Nauki i Współpracy, Wydział Fizyki i Informatyki Stosowanej AGH

M. WOŁOSZYN

- Member of the Quality of Education Team at the Faculty of Physics and Applied Computer Science, AGH
- Referee of scientific journal: Solid State Communications

- Członek Wydziałowego Zespołu ds. Jakości Kształcenia na Wydziale Fizyki i Informatyki stosowanej AGH
- Recenzent czasopisma naukowego: Solid State Communications

Department of Particle Interaction and Detection Techniques
Katedra Oddziaływań i Detekcji Cząstek

STAFF

HEAD

prof. dr hab. inż. Władysław Dąbrowski, full professor

ELEMENTARY PARTICLES PHYSICS GROUP
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prof. dr hab. Danuta Kisielewska, full professor
dr hab. inż. Mariusz Przybycień, associate professor
dr inż. Leszek Adamczyk, assistant professor
dr inż. Tomasz Bołd, assistant professor
dr inż. Iwona Grabowska-Bołd, assistant professor
dr inż. Agnieszka Obłąkowska-Mucha, assistant professor
dr inż. Tomasz Szumlak, assistant professor
dr inż. Grzegorz Gach, teaching assistant
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NUCLEAR ELECTRONICS AND RADIATION DETECTION GROUP
ZESPÓŁ ELEKTRONIKI JĄDROWEJ I DETEKCJI PROMIENIOWANIA

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dr inż. Paweł Hottowy, assistant professor
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dr inż. Bartosz Mindur, assistant professor
dr inż. Andrzej Skoczeń, assistant professor
dr inż. Krzysztof Świentek, assistant professor
dr inż. Piotr Wiącek, assistant professor
dr inż. Stefan Koperny, teaching assistant
dr inż. Szymon Kulis, teaching assistant
inż. Przemysław Terlecki
Wiesław Filipek

PROFILE

The scientific activity of Department covers three areas of research:

- basic research of elementary constituents of the matter and their interactions in high energy collisions,
- design and construction of detectors and readout electronics for high energy physics experiments,
- development of detectors and readout electronics for neuroscience experiments and for medical imaging.

The high energy physics experiments are long term projects and because of the high cost of large accelerators and detection facilities they are performed by large international collaborations. Our participation in thse experiments is as complete as possible and covers all phases of the projects: preparations of the research programs, design and construction of the experimental apparatus, data analyses as well as maintaining and upgrading detector systems.

Currently the members of the Department participate in analysis of data from three experiments, which have finished data taking:

- ZEUS $e\pm p$ at HERA (DESY),
- DELPHI $e+e-$ at LEP (CERN),
- OPAL $e+e-$ at LEP (CERN),

Since mid of nineties the members of the Department participated in the design and construction of two new experiments at the LHC accelerator at CERN:

- ATLAS p-p, p-Pb and Pb-Pb,
- LHCb p-p and p-Pb,

and after commissioning of the LHC in 2010 they contribute to running of the experiments and to data analysis. A special attention is paid to processes leading to a New Physics, particularly to Higgs and supersymmetric particles discoveries in ATLAS experiment. Study of CP violation in beauty and charm sector in the LHCb experiment can explain matter - antimatter asymmetry observed in the Universe. Also, searching for rare decays of B mesons - that can also be sensitive to phenomena related to New Physics is being exploited.

Tematyka naukowa Katedry obejmuje trzy kierunki badań:

- badania podstawowe elementarnych składników materii i ich oddziaływań metodą zderzeń wysokoenergetycznych wiązek,
- rozwój detektorów i aparatury elektronicznej dla eksperymentów fizyki wysokich energii,
- rozwój detektorów i aparatury elektronicznej dla eksperymentów neurobiologicznych oraz dla obrazowania medycznego.

Eksperymenty fizyki wysokich energii są projektami długofalowymi, a budowa akceleratorów i aparatury detekcyjnej wymaga dużych nakładów finansowych prace z dziedziny fizyki cząstek elementarnych mogą być prowadzone tylko w ramach dużych międzynarodowych zespołów. Nasz udział w eksperymentach obejmuje wszystkie ich fazy od przygotowania programu fizycznego poprzez projektowanie i budowę elementów aparatury detekcyjnej, jej obsługę i modernizację, po analizę danych.

Pracownicy Katedry uczestniczą w trzech eksperymentach, które zakończyły już zbieranie danych, ale analiza materiału doświadczalnego i publikowanie uzyskanych wyników trwa nadal:

- ZEUS na akceleratorze $e^{\pm}p$ HERA w ośrodku DESY,
- DELPHI na akceleratorze $e^{+}e^{-}$, LEP w CERN-ie,
- OPAL na akceleratorze $e^{+}e^{-}$, LEP w CERN-ie.

Od połowy lat 90-tych pracownicy Katedry uczestniczyli w projektowaniu i budowie aparatury dla dwóch nowych eksperymentów na akceleratorze LHC w CERN-ie:

- ATLAS: p-p, p- Pb i Pb-Pb,
- LHCb: p p, p-Pb,

a od 2010 roku, po uruchomieniu akceleratora LHC, uczestniczą w prowadzeniu tych eksperymentów i analizie danych.

Celem eksperymentów na LHC jest bezpośrednie odkrycie obiektów związanych z tzw. Nową Fizyką.

In 2011 a collaboration has been established with an experiment on the relativistic heavy ion interactions at the RHIC accelerator in Brookhaven National Laboratory:

- STAR *p-p* and *ion-ion*.

The activity in the area of detectors and readout electronics focuses on development of position sensitive detectors and readout systems employing Application Specific Integrated Circuits. These projects are carried out in collaboration with individual abroad partners as well as in the frame of large international projects:

- ATLAS Detector Upgrade,
- LHCb Detector Upgrade,
- RD50 – Radiation hard semiconductor devices for very high luminosity colliders,
- RD51 – Development of micro-pattern gas detector technologies,
- International Linear Collider – ILC,
- Compact Linear Collider – CLIC.

In the area of neuroscience we develop systems for imaging of neural activity in live neural tissues, including retina and cortex. A common aim of various research projects carried out in collaboration with neuroscientists is to develop two ways communication between live neurons and electronic circuits.

Poszukiwanie cząstki Higgsa oraz cząstek supersymetrycznych jest priorytetowym zadaniem eksperymentu ATLAS. Z kolei badanie stopnia łamania symetrii CP oraz rzadkich rozpadów w eksperymencie LHCb może również prowadzić do odkrycia Nowej Fizyki i być może wyjaśnienia głębokiej asymetrii pomiędzy materią i antymaterią. Poszukiwania rzadkich rozpadów mezonów zawierających kwark b są czułym narzędziem w badaniu praw tzw. Nowej Fizyki.

Od 2011 roku została podjęta współpraca z zespołem eksperymentu na akceleratorze relatywistycznych ciężkich jonów RHIC w Brookhaven National Laboratory:

- STAR p-p, jon-jon.

Działalność w dziedzinie detektorów i systemów elektroniki odczytu koncentruje się na rozwoju detektorów pozycjo-czułych i systemów odczytu detektorów z wykorzystaniem techniki specjalizowanych układów scalonych. Prace te prowadzone są zarówno we współpracy z indywidualnymi partnerami zagranicznymi, jak również w ramach dużych projektów międzynarodowych:

- Modernizacja detektora ATLAS,
- Modernizacja detektora LHCb,
- RD50 – Radiation hard semiconductor devices for very high luminosity colliders,
- RD51 – Development of micro-pattern gas detector technologies,
- International Linear Collider – ILC,
- Compact Linear Collider – CLIC.

W dziedzinie badań neurobiologicznych rozwijane są systemy do obrazowania aktywności neuronalnej w żywych tkankach nerwowych, takich jak siatkówka oka i kora mózgowa. Wspólnym celem różnych projektów badawczych prowadzonych we współpracy z neurobiologami jest opracowanie dwukierunkowej komunikacji pomiędzy żywymi neuronami i obwodami elektronicznymi.

ACHIEVEMENTS

- Participation in measurements of $D^{*\pm}$, $D^{\pm}$ and of J/ψ i ψ' mesons production in deep inelastic scattering and photoproduction in the ZEUS experiment. Measurement of the charm fragmentation functions in photoproduction and combination of measurements of charm production cross section in deep inelastic scattering performed on H1 and ZEUS data. (4 publications in Journal of High Energy Physics and one publication in each of European Physical Journal C, Physics Letters B oraz Nuclear Physcis B),
- Study of the dynamics of heavy ion collisions *Au+Au* with STAR experiment. Measurements of flow parameters of identified hadrons and dijets as well as measurement of J/ψ azimuthal anizotrophy. (5 publications in Physical Review C, 2 in Physical Review Letters and 2 in Physics Letters B),
- Leading role in *Pb-Pb* and *p-Pb* data analysis in the ATLAS experiment: measurements of different kinds of correlations and weak-boson production in *Pb-Pb* collisions and preparation of ATLAS collaboration papers with these results (3 papers in Physical Review Letters, 2 in Physics Letters B and 1 in Journal of High Energy Physics),
- Contribution to investigation of the Higgs boson properties (6 papers)
- Contribution to the ATLAS TRT detector upgrade at CERN,
- Contribution to discovery of the rare decay mode $B_s^0 \to \mu^-\mu^+$ used as a precise probe for New Physics searches beyond the Standard Model (LHCb experiment)
- Contribution to first observation of the CP violation in the decays of B_s^0 mesons (LHCb experiment)
- Observation and monitoring of the radiation damage in micro-strip silicon sensors of the LHCb vertex locator (RD50 Collaboration)

- Udział w pomiarach produkcji mezonów $D^{*\pm}$, $D^{\pm}$ oraz J/ψ i ψ' w procesach rozpraszania głęboko nieelastycznego oraz fotoprodukcji w eksperymencie ZEUS. Wyznaczenie funkcji fragmentacji kwarku powabnego w fotoprodukcji oraz przeprowadzona wspólnie z eksperymentem H1 analiza produkcji kwarków powabnych w rozpraszaniu głęboko nieeleastycznym. (4 publikacje w Journal of High Energy Physics oraz po jednej w European Physical Journal C, Physics Letters B oraz Nuclear Physcis B)
- Badanie dynamiki oddziaływań w zderzeniach ciężkich jonów *Au+Au* w eksperymencie STAR. Pomiary parametrów przepływu eliptycznego oraz produkcji di-dżetów i mezonów J/ψ (5 publikacji w Physical Review C, 2 publikacje w Physical Review Letters oraz 2 w Physics Letters B).
- Wiodący rola w analizie danych oddziaływań *Pb-Pb* oraz *p-Pb* w eksperymencie ATLAS: pomiary różnego typu korelacji i badanie bozonów pośredniczących *W* i *Z* w zderzeniach *Pb-Pb* oraz przygotowanie publikacji współpracy ATLAS na te tematy (3 publikacje w Physical Review Letters, 2 w Physics Letters B i 1 w High Energy Physical Journal).
- Udział w szczegółowych analizach własności bozonu Higgsa (6 publikacji)
- Udział w pracach związanych z unowocześnieniem detektora TRT eksperymentu ATLAS
- Udział w odkryciu rozpadu rzadkiego $B_s^0 \to \mu^-\mu^+$ służącego do poszukiwania sygnałów Nowej Fizyki poza Modelem Standardowym
- Udział w odkryciu zjawiska łamania symetrii kombinowanej CP w rozpadach mezonów B_s^0
- Obserwacja zniszczeń radiacyjnych w mikropaskowych sensorach krzemowych detektora wierzchołka eksperymentu LHCb (w ramach współpracy RD50)

- Contribution to test-beam activities related to studies of new sensors and front-end readout technologies for the future tracking and vertexing systems for upcoming LHC upgrades (RD50 Collaboration)
- Design and tests of readout ASICs in deep submicron 130 nm CMOS technology, front-end electronics and ADC, for the LumiCal detector for the ILC/CLIC experiment (12 conference presentations).
- Development and test-beam of the front-end electronics for straw tube detectors for the PANDA experiment, in submicron 350 nm CMOS technology (2 papers).
- Design and tests of monolithic pixel detectors in a novel submicron Lapis 200nm SOI CMOS technology (1 paper and 2 conference presentations).
- Development of a 2-D imaging system based on the Gas Electron Multiplier technology and its application to investigation of cultural heritage paintings (3 paper in Journal of Instrumentation).
- Development of a method of selective electrical stimulation of ganglion cells in the primate retina for the design of visual prostheses (published in The Journal of Neuroscience).

- Udział w testach nowych typów sensorów oraz układów odczytu front-end dla przyszłych systemów pomiaru torów cząstek i wierzchołków oddziaływań (w ramach współpracy RD50)
- Opracowanie i testy układów scalonych w technologii 130 nm CMOS, układów elektroniki front-end i ADC, dla detektora LimiCal w eksperymentach ILC/CLIC (12 prezentacji konferencyjnych).
- Opracowanie układów elektroniki front-end w technologii 130 nm CMOS do odczytu detektorów słomkowych w eksperymencie PANDA i przeprowadzenie testów na wiązce (2 publikacje).
- Opracowanie projektów i testy monolitycznych detektorów pikselowych w submikronowej technologii 200 nm SOI CMOS (1 publikacja i 2 prezentacje konferencyjne)
- Opracowanie dwuwymiarowego systemu obrazowanie opartego na technologii gazowych powielaczy elektronów (GEM – Gas Electron Multiplier) i zastosowanie do badania dzieł malarskich (3 publikacje w Journal of Instrumentation).
- Opracowanie metody selektywnej stymulacji elektrycznej komórek zwojowych siatkówki pod kątem możliwych zastosowań w wizualnych protezach siatkówki (praca w The Journal of Neuroscience).

ACTIVITY

T. BOŁD

- Deputy coordinator of Heavy Ion Trigger Menu Forum of the ATLAS experiment, CERN
- Member of Trigger/DAQ Institute Board in ATLAS experiment, CERN

- Reprezentant WFiIS w komitecie Trigger/DAQ eksperymentu ATLAS, CERN
- Zastępca koordynatora systemu wyzwalania dla danych ciężko-jonowych w eksperymencie ATLAS, CERN

W. DĄBROWSKI

- Representative of AGH-UST in the Consortium Council of the National Centre for Hadron Radiotherapy.
- Member of the editorial board of the Journal of Instrumentation.
- Representative of the polish member groups (AGH-UST, Jagiellonian University and The Henryk Niewodniczański Institute of Nuclear Physics Polish Academy of Sciences) in the the Upgrade Advisory Board of the ATLAS collaboration.

- Reprezentant AGH w Radzie Zarządzającej Narodowego Centrum Radioterapii Hadronowej
- Członek komitetu redakcyjnego czasopisma Journal of Instrumentation
- Reprezentant polskich grup (WFiIS AGH, UJ, IFJ PAN) w komitecie doradczym do modernizacji eksperymentu ATLAS (Upgrade Advisory Board)

I.GRABOWSKA - BOŁD

- Coordinator of Heavy Ion Trigger Menu Forum of the ATLAS experiment, CERN
- Member of the Speakers Committee Advisory Board of the ATLAS experiment, CERN (2013-2015)

- Koordynator systemu wyzwalania dla danych ciężkojonowych w eksperymencie ATLAS, CERN
- Członek komitetu doradczego SCAB (Speakers Committee Advisory Board) w eksperymencie ATLAS, CERN (2013-2015)

M. IDZIK

- Technical Coordinator of FCAL (International Collaboration for Forward Detectors in future Linear Collider ILC/CLIC).
- Coordinator of the SALT – Common Silicon Strip Readout ASIC for the LHCb Upgrade
- Representative of AGH-UST in Collaboration Board of the PANDA experiment.

- Koordynator techniczny międzynarodowej współpracy FCAL (Forward Detectors in Future Linear Colliders ILC/CLIC)
- Koordynator projektu SALT - Common Silicon Strip Readout ASIC for the LHCb Upgrade we współpracy LHCb
- Reprezentant WFiIS AGH w Radzie Współpracy eksperymentu PANDA

D. KISIELEWSKA

- Member of Scientific Council of The Henryk Niewodniczański Institute of Nuclear Physics Polish Academy of Sciences (2011-2014)
- Member of Scientific Council of the National Centre for Nuclear Research (2011-2014)
- Chairman of Experts Team of Fundamental Constituents of Matter Panel (ST-2) in National Science Center (2013-2014)
- Chairman of Experts Team SI-8 in Commission for Science and Engineering in Committee for Evaluation of Scientific Units (2013-2014)
- Representative of AGH-UST and Jagellonian University in Collaboration Board of the ATLAS experiment at CERN
- Representative of AGH-UST and Jagellonian University in Collaboration Board of the ZEUS experiment at DESY

- Członek Rady Naukowej Instytutu Fizyki Jądrowej PAN im Henryka Niewodniczańskiego (2011-2014)
- Członek Rady Naukowej Narodowego Centrum Badań Jądrowych , Świerk (2011-2014)
- Przewodnicząca Zespołu Ekspertów w dziale Nauk Ścisłych i Technicznych NCN, panel ST2 (2013-2014)
- Przewodnicząca Zespołu Ewaluacji SI-8 przy Komitecie Ewaluacji Jednostek Naukowych (2013-2014)
- Reprezentant WFiIS AGH-UST/UJ w Radzie Współpracy ATLAS w CERN
- Reprezentant WFiIS AGH-UST/UJ w Radzie Współpracy ZEUS w DESY

B. MINDUR

- The team leader of Krakow RD51 group at CERN.
- Member of TRT Institute Board in ATLAS experiment at CERN.
- Referee of scientific journal: Journal of Instrumentation

- Koordynator grupy krakowskiej w ramach współpracy RD51 w CERN.
- Reprezentant WFiIS AGH w komitecie TRT eksperymentu ATLAS w CERN.
- Recenzent czasopisma naukowego: Journal of Instrumentation.

T. SZUMLAK

- Honorary Fellowship position with School of Physics and Astronomy - University of
- Glasgow (2010-2015).
- Honorary Fellowship position in the School of Physics and Astronomy - University of Manchester (2011 - 2014).
- The LHCb VELO VETRA Software and Calibration Project leader (2013-2015).
- The Krakow VELO group leader (2011 - 2013).
- LHCb Upgrade Coordinator for Poland

- Honorowy członek kolegium Szkoły Fizyki i Astronomii Uniwersytetu w Glasgow.
- Koordynator grup oprogramowania i kalibracji detektora VELO w eksperymencie LHCb.
- Honorowy członek kolegium Szkoły Fizyki i Astronomii Uniwersytetu w Manchester.
- Koordynator krakowskiej grupy LHCb oraz VELO (VErtex LOcator)
- Koordynator modernizacji eksperymentu LHCb w Polsce

Department of Applied Nuclear Physics
Katedra Zastosowań Fizyki Jądrowej

STAFF

HEAD
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PHYSICS OF FUNCTIONAL MATERIALS GROUP
ZESPÓŁ FIZYKI MATERIAŁÓW FUNKCJONALNYCH
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ENVIRONMENTAL PHYSICS GROUP
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dr inż. Jarosław Nęcki, assistant professor
dr hab inż. Nguyen Dinh Chau, associate professor
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dr inż. Mirosław Zimnoch, assistant professor
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dr inż. Paweł Jodłowski, teaching assistant
mgr inż. Michał Marzec
mgr inż. Halina Mróz
Franciszek Pach
Ryszard Wróblewski

NUCLEAR METHODS GROUP
ZESPÓŁ METOD JĄDROWYCH
prof. dr hab. inż. Andrzej Kreft, associate professor
dr Andrzej Bolewski, assistant professor
dr inż. Marek Ciechanowski, assistant professor
dr Wilhelm Czapliński, assistant professor

PHYSICS OF STRONGLY INTERACTING SYSTEMS GROUP
ZESPÓŁ FIZYKI UKŁADÓW SILNIE ODDZIAŁYWUJACYCH
prof. dr hab. Bożek Piotr, full professor

PROFILE

Department of Applied Nuclear Physics (DANP) is composed of four groups: (i) Environmental Physics Group, (ii) Nuclear Methods Group, (iii) Physics of Functional Materials Group, and (iv) Physics of Strongly Interacting Systems Group. Research activities of DANP cover selected topics of nuclear physics and their applications in areas such as environmental sciences, material sciences as well as industrial applications of nuclear methodologies. DANP is active also in fundamental research related to properties and dynamics of many-body systems such as neutron stars and heavy ion collisions at intermediate and ultra-relativistic energies. Moreover, DANP is strongly involved in teaching in the framework of the disciplines of Technical Physics and Medical Physics being offered by the Faculty at B.Sc. and M.Sc. level.

Major instrumentation available at DANP:

- an arc melting system with contactless ignition for synthesis of materials,
- a Czochralski system for synthesis of monocrystals,
- a system to measure electrical resistivity,
- a system to measure magnetostriction,
- a measuring system for magnetoelectric effect,
- an electrical poling system
- electrolytic enrichment system for low-level tritium assay in natural waters,
- analytical systems for determination of trace gas concentrations in the atmosphere,
- analytical systems for determination of stable isotope ratios of light elements (H, C, O, N) in environmental materials,

Katedra Zastosowań Fizyki Jądrowej składa się z czterech zespołów badawczych: (i) Zespołu Fizyki Środowiska, (ii) Zespołu Metod Jądrowych, (iii) Zespołu Fizyki Materiałów Funkcjonalnych, oraz (iv) Zespołu Fizyki Układów Silnie Oddziaływujących. Badania naukowe prowadzone w Katedrze obejmują wybrane zagadnienia fizyki jądrowej w kontekście jej zastosowań takich jak nauki o środowisku, nauki o materiałach, a także przemysłowe zastosowania metod jądrowych. Ponadto, w Zespole Układów Silnie Oddziaływujących prowadzone są badania podstawowe dotyczące dynamiki układów silnie oddziaływujących (gwiazdy neutronowe, zderzenia jąder o pośrednich i skrajnie relatywistycznych energiach). Katedra i jej zespoły są silnie zaangażowane w dydaktykę specjalistyczną prowadzoną na Wydziale ramach kierunku Fizyka Techniczna oraz Fizyka Medyczna, na obu stopniach studiów.

Ważniejsza aparatura naukowa będąca w posiadaniu Katedry:

- układ do syntezy materiałów w łuku elektrycznym z bezkontaktowym zapłonem,
- aparatura Czochralskiego do otrzymywania monokryształów,
- układ do pomiaru oporności elektrycznej,
- układ do pomiaru magnetostrykcji,
- aparatura do pomiaru efektu magnetoelektrycznego,
- układ do elektrycznego polaryzowania
- aparatura do elektrolitycznego wzbogacania prób wody w tryt;
- systemy analityczne do pomiaru gazów śladowych w atmosferze;
- systemy analityczne do pomiaru stosunków izotopowych pierwiastków lekkich (H, C, O, N) w różnych matrycach;

- liquid scintillation spectrometers for measurements of low-level activities of selected radionuclides (^{3}H, ^{14}C, ^{90}Sr, ^{210}Pb, ^{222}Rn, isotopes of uranium, thorium and radium) in environmental materials,
- low-level gamma spectrometry for measurements of low-level activities of selected radionuclides in environmental materials,
- Analytical set-up for measuring neutron parameters of materials.

- system do pomiaru aktywności naturalnych i sztucznych nuklidów gamma-promieniotwórczych w próbkach stałych i ciekłych z wykorzystaniem spektrometrii gamma;
- spektrometry ciekło-scyntylacyjne do pomiarów niskich aktywności izotopów promieniotwórczych (^{3}H, ^{14}C, ^{90}Sr, ^{210}Pb, ^{222}Rn, izotopy uranu, toru i radu);
- stanowisko pomiarowe do pomiarów parametrów neutronowych materiałów.

ACHIEVEMENTS

- Determination of electrical and magnetic properties against a number of 3d electrons for intermetallic compounds (Tb-Dy)(Fe-Co)$_2$, (Y-Gd)(Fe-Co)$_2$, Ho(Mn-Fe)$_2$, Ho(Co-Ni)$_2$.
- Determination of magnetoelectric effect dependencies on composition, external magnetic field intensity and frequency, for composites (Tb-Dy-Y)Fe$_2$/PVDF.
- Development of a new method for measuring the neutron fluence based on the reaction $^{14}N(n, p)^{14}C$ in melamine ($C_3H_6N_6$) and the use of AMS technique for determining ^{14}C content.
- Calculation of rates for the formation and decay of muonic molecules of helium and hydrogen.
- Explanation of experimental observations in proton-lead collisions at the LHC assuming the existence of significant collective flow in small systems. Relativistic hydrodynamic model simulations reproduce the measured transverse momentum spectra and the harmonic flow coefficients.
- Determination of temporal and spatial variability of biogenic CO_2 fluxes within the Krakow agglomeration.

- Wyznaczenie zależności właściwości elektrycznych i magnetycznych od liczby elektronów 3d dla związków międzymetalicznych (Tb-Dy)(Fe-Co)$_2$, (Y-Gd)(Fe-Co)$_2$, Ho(Mn-Fe)$_2$, Ho(Co-Ni)$_2$.
- Wyznaczenie zależności efektu magnetoelektrycznego od składu kompozytu (Tb-Dy-Y)Fe$_2$/PVDF, od natężenia przyłożonego pola magnetycznego i jego częstotliwości.
- Opracowanie nowej metody pomiaru fluencji neutronów opartej na reakcji $^{14}N(n,p)^{14}C$ zachodzącej w melaminie i zastosowaniu techniki AMS do oznaczania ^{14}C.
- Obliczenie szybkości powstawania i rozpadu molekuł mionowych helu i wodoru.
- Wyjaśniono wyniki eksperymentów dla zderzeń proton-ołów na zderzaczu LHC zakładając tworzenie się przepływu kolektywnego. Wyniki symulacji w modelu hydrodynamiki relatywistycznej odtwarzają zmierzone rozkłady w pędzie poprzecznym i współczynniki przepływu kolektywnego.
- Określenie zmienności czasowo-przestrzennej strumieni biogenicznego CO_2 w obrębie aglomeracji krakowskiej.

ACTIVITY

CH. NGUYEN DINH

- Member of the Editorial Board of the International Journal of Nuclear Energy Science and Engineering (since 2011)
- Member of the Editorial Board of the Journal of Pollution Effects & Control

- Członek zespołu redakcyjnego czasopisma ”International Journal of Nuclear Energy Science and Engineering”
- Członek zespołu redakcyjnego czasopisma “Journal of Pollution Effects & Control”

A. KREFT

- Member of the Physics Committee of the Polish Academy of Sciences (2011-2014)
- Member of the Coordination team of the Clean Energy Cluster

- Członek Komitetu Fizyki Polskiej Akademii Nauk (2011-2014)
- Członek zespołu koordynującego Klaster Czystej Energii

K. RÓŻAŃSKI

- Member of the Polish National Committee, International Geosphere and Biosphere Programme of the International Council for Science, Polish Academy of Science.
- Member of the Editorial Board of the journal “Isotopes in Environmental and Health Studies (since 2000)
- Vice-chairman of the Society of Research on Environmental Changes “GEOSPHERE”
- Member of the Council of School of Environmental Protection and Engineering

- Członek Polskiego Komitetu “Global Change” Międzynarodowego Programu Badań Geosfery i Biosfery Międzynarodowego Komitetu Nauki, przy Polskiej Akademii Nauk
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Selected results

Fe/CoO(001) and Fe/CoO(111) bilayers: the effect of crystal orientation on the exchange bias

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The importance of the crystal orientation on the properties of the ferromagnetic/aniferromagnetic bilayer thin films that show the exchange bias emerges from different, orientation related, arrangements of the interfacial magnetic moments. The most interesting cases for the antiferromagnetic oxides of the rock salt structure are the magnetically compensated (001) surface and the magnetically uncompensated (111) surface. However, the studies dealing with the (111) oriented rocksalt oxides are sparse, due to the instability of the (111) rocksalt oxides crystals related to their polarity [1]. In order to deal with this problem, a highly controllable method of the layer-by-layer (LBL) deposition of the polar oxide thin films was developed [2].

The acquired knowledge of the preparation of the polar ultrathin films was subsequently used to grow (111)-oriented CoO layers. To allow the direct comparison, CoO(001) was also prepared using the same LBL method. CoO(001) and CoO(111) were the base for the growth of the Fe/CoO bilayers, for which the effect of crystal orientation on the exchange bias was investigated [3].

The resulting CoO bilayers of both orientations were carefully characterized in terms of their crystalline structure and stoichiometry. Low energy electron diffraction (LEED) showed that the CoO layers were highly ordered and unreconstructed. For both orientations, X-ray photoemission spectroscopy measurements revealed the spectra characteristic for CoO, with slightly reduced surfaces. The surface reduction was deemed to be the sufficient factor stabilizing the CoO(111) polar surface. The ^{57}Fe Mössbauer probe layers, 2monolayers thick, were deposited onto the CoO films. The structures were completed with ^{56}Fe up to 50 Å. As shown by conversion electron Mössbauer spectroscopy, the two bilayers were similar also in terms of the chemical structure of the Fe/CoO interface, where a fraction of the monolayer of Fe was found to be oxidized and approximately 4 Å of Fe was found to be mixed with metallic Co. Fe layers grew epitaxially onto CoO, as shown by LEED. While for the CoO(001) Fe was (001) oriented, in the case of CoO(111) Fe was exposing the Fe(110) plane, which due to the symmetry reasons formed grains of the three equivalent directions, rotated by 120°. The intrinsic magnetic anisotropy of the Fe films was related to the growth mode. While for Fe/CoO(001) the anisotropy showed a four-fold symmetry, with the anisotropy constant very close to bulk Fe, for Fe/CoO(111) a weak uniaxial growth-induced magnetic anisotropy

was found, which points to a weak or even lacking magnetocrystalline anisotropy for that case.

Field cooling was applied to investigate the exchange bias in the Fe/CoO bilayers. Despite the fact that the crystalline structure and stoichiometry of the CoO films was comparable for Fe/CoO(001) and Fe/CoO(111), and the two systems contained the interfaces very similar in terms of the chemical structure, their exchange bias performance was drastically different, as shown in Fig.1.

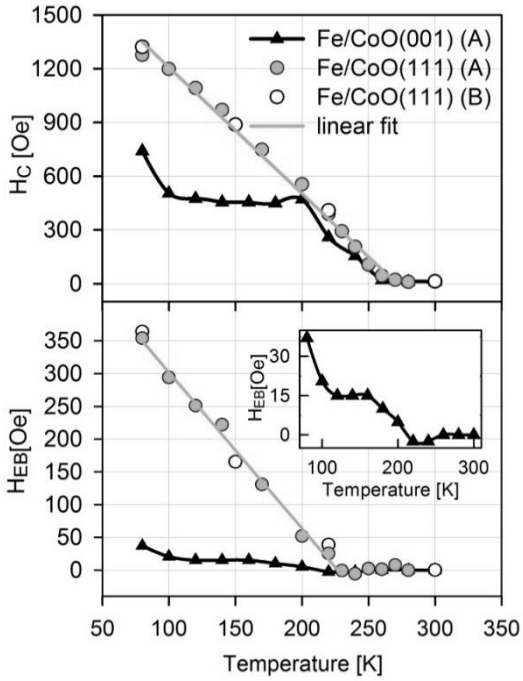

Fig.1. Temperature dependence of the coercive field (H_C) and exchange bias field (H_{EB}) for Fe/CoO(001) and Fe/CoO(111) measured after single field cooling (FC) procedure (A, full symbols) and measured after FC performed for Fe/CoO(111) at each temperature separately (B, empty symbols). The inset shows rescaled H_{EB} temperature dependence for the Fe/CoO(001) sample. For Fe/CoO(111) sample both parameters were fitted with a linear temperature dependence. For Fe/CoO(001), the solid lines are guides to the eye (after [3]).

For Fe/CoO(111), the structure containing the magnetically uncompensated antiferromagnet and the ferromagnet of the low magnetocrystalline anisotropy, the loop shift was found to be ten times larger (354 Oe) than for the magnetically compensated Fe/CoO(001) (37 Oe). Therefore, the decisive role of the crystal orientation on the exchange bias phenomenon was proven.

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Co atoms on Bi_2Se_3 revealing a coverage dependent spin reorientation transition

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Topological insulators (TI), so called due to their electronic structure topology different from that in the conventional insulators, is a group of materials predicted theoretically about 15 years ago and found experimentally, at least in their 3D form, only recently. The best recognized feature of this class is the existence of metallic states whenever the TI material breaks its continuity, e.g. on the surface. In such a case, the linear dispersion relation exists in a form of a Dirac cone on top of otherwise insulating bulk energy gap. Additionally, due to SO interactions, spin of the surface electronic states is confined to momentum: helical spin-momentum states exist, where spin is perpendicular to the momentum vector. This results in the remarkable property: surface electrons cannot be back-scattered, i.e. they are robust against perturbations.

In view of those properties, the natural question arises how they affect the properties of atoms deposited on the surface and how this surface interacts with the deposited adatoms. Addressing these issues, in particular how Co adatoms adsorb on the surface of the 3D topological insulator Bi_2Se_3 and how the surface affects Co properties (here: magnetic anisotropy) is the purpose of the presented results.

The studies were conducted by means of scanning tunneling microscopy and spectroscopy (STM/STS), x-ray absorption spectroscopy (XAS) and x-ray magnetic circular dichroism (XMCD). We explained our findings based on density functional theory (DFT) calculations performed in the generalized gradient approximation. The experiments have been carried out in two separate ultrahigh vacuum systems: STM and STS experiments were performed in Hamburg, at 5K, on Bi_2Se_3 single crystals in situ cleaved at low temperatures. The XAS and XMCD experiments have been carried out at the ID08 beamline at the ESRF. X-ray absorption spectra were obtained using almost 100% polarized light. Magnetic fields of up to 5 T were applied collinear to the incident beam and the sample could be rotated from normal to the almost grazing incidence angle (70°) to obtain information about the in- and out-of-plane magnetic properties.

First, two different types of Co atoms adsorption sites were found experimentally and simulated theoretically using DFT calculations: Co_A, in an almost six-fold-symmetry fcc hollow site and Co_B

in the hcp hollow site in a threefold symmetry surrounding (Figure 1). For a small coverage of 0.01 monolayer (MLE) the relative abundance of both species is approximately three to one with a predominance of energetically favorable Co_A type adatoms.

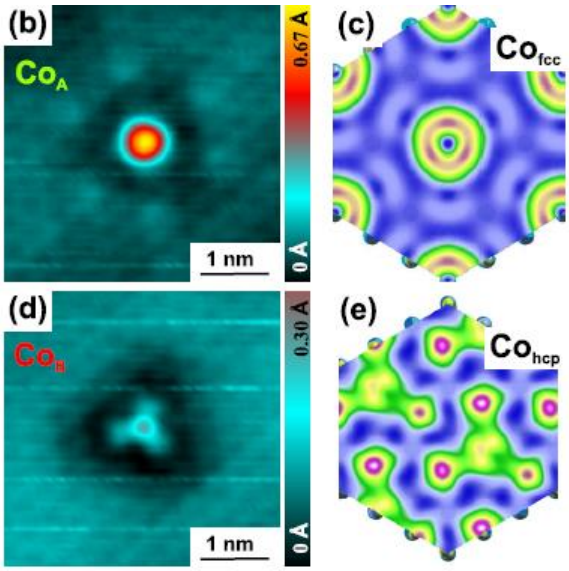

Fig. 1. STM topography (b,d) and DFT simulations of two different isolated Co adatoms on Bi_2Se_3 surface in the fcc (c) and hcp (e) hollow sites .

STS shows a pronounced peak for only one species of the Co adatoms indicating different electronic properties of both types. These differences were confirmed and explained on the basis of our DFT calculations by different hybridizations with the substrate. Additionally, we found that Co further n-dopes the substrate, but, in contrast to recent predictions [1, 2], no indication of a global surface band gap has been found after the deposition of Co adatoms.
The electronic and magnetic properties have been further tested by XAS and XMCD measurements. Different coverages ranging from 0.01 to 0.08 monolayer have been investigated. The XAS line shape suggests the Co atoms to be in a high-spin $3d^7$ electronic configuration ground state. We have also found the easy axis to reside in the surface plane, contrary to predictions of an out-of-plane anisotropy for Co/Bi_2Se_3 in [2,3]. This fact is particularly in line with our calculations, which predict an easy-plane magnetocrystalline anisotropy energy in case of fcc hollow site occupation and an out-of-plane one in case of the hcp hollow site. Taking the relative abundance into account, an easy-plane anisotropy is theoretically expected.
Moreover, we investigated the anisotropy using the normalized L3 XMCD intensity as a function of the coverage, see Figure 2. It suggest an in-plane easy axis at low coverages (0.01–0.04 MLE) and an out-of-plane easy axis for 0.08 MLE. We suggest clustering to be the predominant cause for this observation.

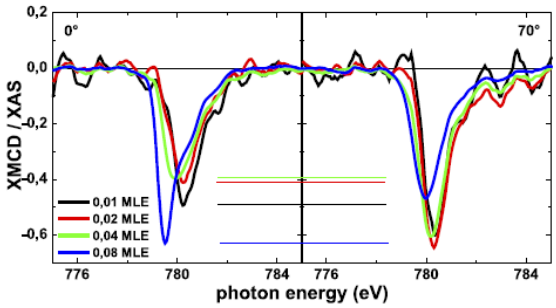

Fig. 2. Normalized XMCD signals for a series of coverages for normal (left panel) and grazing (right panel) incidence angle. Note a coverage dependent spin reorientation transition from easy-plane toward out-of-plane, possibly caused by clustering.

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The oxidation state of iron as a potential indicator of brain tumour malignancy grade.

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The second most common cause of death is cancer. Among the types of cancer with the smallest survival rate are brain tumours. In order to successfully combat the disease, it is extremely important to learn about the mechanism of its formation. It is believed that trace elements play a significant role in neoplastic processes. Iron plays a particularly important role as it controls the formation of reactive oxygen species (ROS) via Fenton's reaction, and thus is involved in the oxidative stress.[1] For this reason, information about the differences in its form in healthy and cancerous tissues with various grades of malignancy may significantly contribute to the knowledge of biochemical reactions involved in oncogenesis.

The samples were obtained intraoperatively, trimmed to volumes of about 0.5 cm^3 and placed in specially prepared polymer measurement containers. They were then immediately frozen at -80˚C to slow down biological and chemical processes, e.g. oxidation. This allows the tissues to be analyzed in a natural form similar to that in which they occur in the human body.

In this study, X-ray absorption spectroscopy (XAS) was used to assess the forms in which iron occurs. The measurements were carried out on synchrotrons in HASYLAB, DESY (DORIS III, beamline C) and ESRF (beamline BM23). The beam was collimated to a size of 2x5 mm for the purpose of bulk analysis. Measurements were performed in the fluorescence mode due to low concentrations of the analysed elements (~ 100 mg/kg). During measurements, the samples were cooled with liquid nitrogen or liquid helium. The temperature measured at the sample holder was not greater than -160˚C. The XAS profiles for iron were collected at the K-edge in a range of 7.05 keV to 7.70 keV. The spectra were processed using the Athena program of the IFEFFIT package.

Spectroscopic studies were completed with immunohistochemical studies, which make it possible to determine the level of hypoxia of the studied cells in order to determine its possible effect on the oxidation state of iron. To assess the extent of hypoxia in the studied tumour tissue we investigated the expression of carbonic anhydrase IX (CA-IX) which is regarded as a reliable marker of hypoxia.

Based on XAFS measurement of iron, fifteen absorption spectra for glial brain tumours with different malignancy grades and for a control sample were obtained (Fig. 1). In the magnified area of the XANES range, it can be observed that the absorption edges measured on tissue samples lie between the absorption edges for Fe(II) and Fe(III), which suggests that iron occurs in both chemical forms in the studied tissues. The exact position of the absorption edge on the energy scale can be determined using the integral method which involves the calculation of the centre of gravity of the absorption curve within the absorption edge range. These results are plotted as a function of the malignancy grade and compared with the energies of the absorption edge for reference materials of inorganic iron (cf. Fig. 2). Analysis of the graph showed that with an increase in the tumour malignancy grade, the ratio of Fe^{2+} to Fe^{3+} content increases.

CAIX expression levels were assessed by a semi-quantitative visual method. Four levels (0-3) of hypoxia were identified. The results obtained by immunohistochemical staining were compared with the previously obtained data on the average oxidation state of iron expressed by the energy at which the absorption edge of iron occurs (Fig. 3.). The graph shows no clear correlation between the values shown on the axes. This suggests that the biochemical mechanism leading to the relationship shown in Figure 2 is not associated with a deficiency of oxygen in the tumour tissue of higher malignancy grade.

The measurements showed that cryogenic methods provide reliable results in the study of biological samples: samples can be analysed without prior complex preparation that might affect the oxidation state of the elements studied.[2]

The results offer hope that analysis of XAFS spectra could be used in the future to assess the malignancy grade of tumours, and provide information helpful in understanding processes associated with neoplasia.

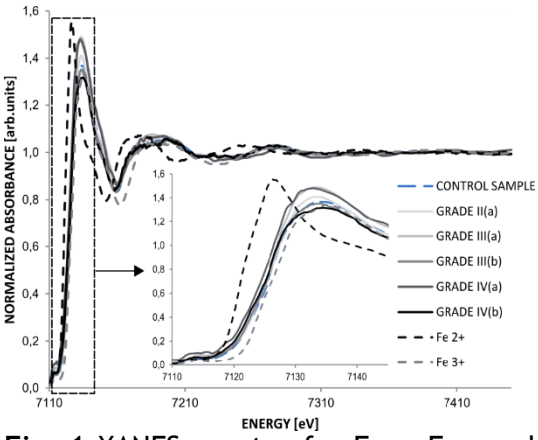

Fig. 1 XANES spectra for Fe^{2+}, Fe^{3+} and brain glioma samples (control sample - brain abscess wall, grade II(a) - atypical mieningioma, grade III(a) – anaplastic oligodendroglioma, grade III(b) – anaplastic astrocytoma, grade IV(a) – glioblastoma multiforme, grade IV(b) – monstrocellular glioblastoma multiforme).

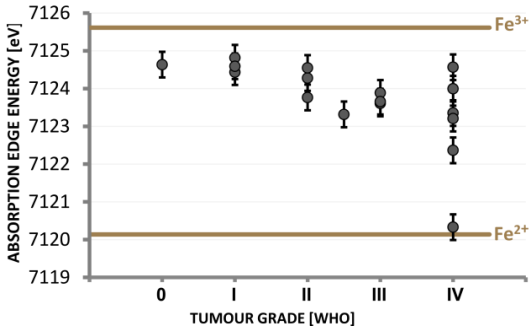

Fig. 2 Absorption edge energies of Fe for various malignancy grades (according to World Health Organization classification) and absorption edge energies for Fe^{2+} and Fe^{3+}.

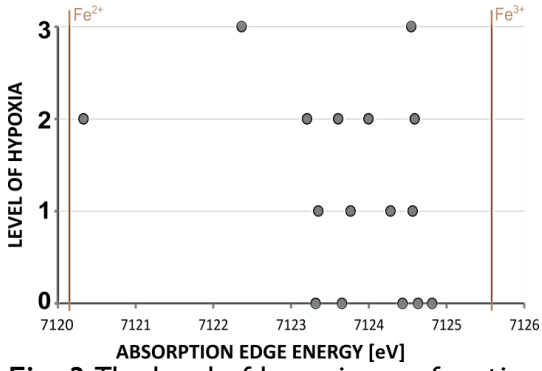

Fig. 3 The level of hypoxia as a function of energy at which occurs the absorption edge of iron contained in the tumour tissue. This energy represents the average oxidation state of iron. Level of hypoxia: 0 – no staining, 1 - weak focal staining, 2 - staining covering more than 20% of the surface, 3 - more than 60% of the surface area stained

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Cell elasticity is an important indicator of the invasive phenotype of cancer cells

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The ability of cancer cells to invade different host tissues is the main cause of death of patients with diagnosed cancer (1). Therefore, extensive research efforts are made to understand how cancer cells spread and to identify cellular parameters that determine the invasive phenotype of the cells. Although the process of metastasis is generally well understood (2), the cellular properties that determine the invasive phenotype of cancer cells are mostly unknown. In recent years biophysical approach to the corresponding phenomenon has lead to identify elasticity as a new marker of the invasive phenotype of cancer cells. It is recognized that during cancer transformation the cells undergo significant reorganization of their cytoskeleton (3), which consequently modify the mechanical properties of cancer cells, in particular their elasticity (4). Different studies have demonstrated that cancer cells with lower values of Young's modulus (the measure of elasticity) also exhibit an increased invasive phenotype (5, 6). However, the molecular mechanisms involved in this process remain virtually unknown.

In the following study we address the issue of cancer cell invasion through micro-porous membrane *in vitro*. Using atomic force microscopy (AFM) we determine the elastic properties of cancer cells with different invasive phenotype. Moreover, using selected cell biology methods we correlate the elasticity of the cells with different other parameters, including those at the molecular level. Example results obtained with atomic force microscopy (AFM) for two AT-2 subclones exhibiting different elastic properties are shown in Figure 1 A and B.

Obtained results clearly show that cells with higher invasive potential display lower values of the Young's modulus. Moreover the distribution of the values is 'normal-like' when compared to the cells with lower invasive phenotype. In the case of these cells the values of the Young's modulus display a log-normal distribution.

Our studies demonstrate that cell elasticity is an important indicator of the invasive phenotype of cancer cells. Detailed discussion of the obtained results is made in [7,8]

A B

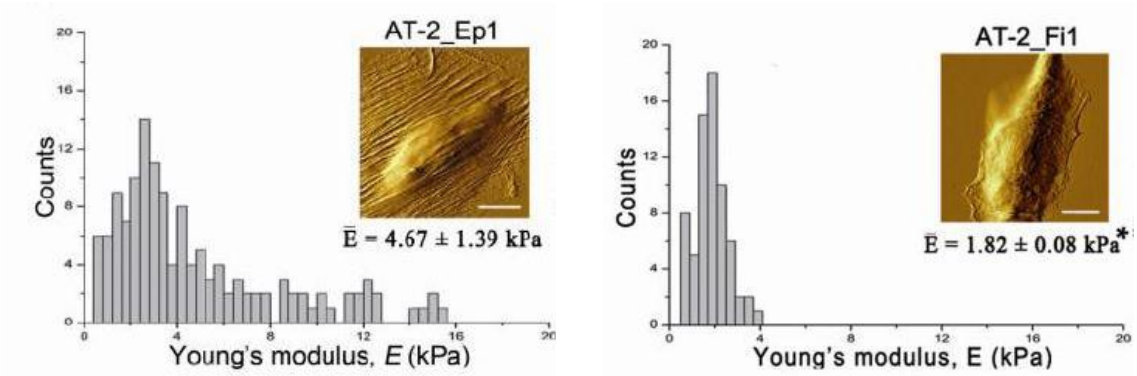

Figure 1. Elasticity of human prostate cancer cells with different invasive phenotype. Histograms of Young's modulus values for cells with low (A) and high (B) invasive phenotype. As evident from the data cells with higher invasive phenotype are softer and display a normal-like distribution of the Young's modulus values. On the other hand cells with low invasive phenotype display a log-normal distribution and have much higher values of the Young's modulus. Taken from supplementary materials [7].

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EFFECT OF MAGNETISM ON LATTICE DYNAMICS IN σ-FeCr ALLOYS*

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The profound knowledge of atomic lattice vibration in solids is essential for the proper understanding of various physical properties such as thermal conductivity, heat capacity, vibrational entropy, Debye temperature, electron-phonon coupling etc. One of the major issues in the field is a possible relationship between magnetism and the lattice vibrations which remains so far an open question. Usually, the effect of magnetism on a phonon density of states is regarded as negligible. However, as shown by Kim [1], the electron-phonon coupling may be strongly enhanced in systems with itinerant magnetism. The σ-phase Fe-Cr alloys seem to be a good candidate for verification of these predictions as they were shown to have fulfilled the Rhodes-Wohlfart criterion for the itinerant magnets with the Curie temperatures, T_C, below 50 K [2]. Here we report results depicting an effect of magnetism – both internal and external -on the atomic lattice vibrations in two σ-phase Fe-Cr samples viz. containing 46 and 48 at% Cr. The results were obtained using the Mössbauer spectroscopy (MS) techniques. The measurements were carried out (a) in the temperature range of 4 – 300 K and zero external magnetic field, and (b) at 4.2 K in an external magnetic field, B_o, of the value up to 13.5 T.

MS is a suitable experimental tool to study the issue and it gives the relevant information via two spectral parameters: (1) the centre shift, *CS*, and the recoil-free factor, *f*. The former is related, via the second-order Doppler shift, *SOD*, to the mean-square velocity of vibrations, $\langle v^2 \rangle$, while the latter to the mean-square amplitude of vibrations, $\langle x^2 \rangle$. In other words, from *CS* one can get information on the kinetic energy of vibrating atoms, E_k, while that on the potential energy, E_p, is encoded in *f*. Consequently, the measured spectra were analyzed to get the average centre shift, <*CS*>, as well as the spectral area, *A*, which is proportional to *f*.

Concerning the results obtained from the zero-field spectra, both dynamical quantities of merit i.e. <*CS*> and *f* showed anomalous behaviour below temperatures coinciding well with the Curie temperatures found for the two samples [2]: <*CS*> was found to be decreasing - Fig. 1 (left panel), while *f* was revealed to be increasing below T_c. Both these effects indicate a hardening of the lattice. As no anomalies in the lattice constants were detected, the observed anomalies in <*CS*> and in *f* are very likely reflecting an electron-phonon coupling. Further support to such interpretation was lent from the spectra recorded in the external magnetic field, B_o. The <*CS*>-values obtained from these spectra – see Fig. 1 (right panel) - turned out to significantly depend on B_o in line with the corresponding dependence found from the zero-field spectra. Expressing <*CS*> in terms of the kinetic energy $E_k = mv^2/2$ and *f* in terms of the potential energy $E_p = 0.5k < x >^2$, where *k* is a spring constant, clearly showed that the total mechanical energy, $E = E_k + E_p$, was not constant in the temperature range where the anomalies exist - see Fig. 2 - except a range of ~4-15 K, where *E* was small but fairly constant. Further-

more, the potential energy was significantly higher that the kinetic one. The latter did not show the expected thermodynamic behaviour, as it decreased with T. All these effects mean that the atomic lattice vibrations in the magnetic state of the investigated samples cannot be properly described in terms of the Debye model (harmonic approximation). The observed effects are, however, compatible with the concept of a spin-phonon coupling that becomes effective at $T \leq T_c$ opening thereby new degrees of freedom into which the total mechanical energy of the vibrating atoms sinks. On the other hand, the kinetic energy derived from the spectra measured at B_o=0T showed an opposite trend i.e. it was increasing with the decrease of T (increase of the magnetization). Similar trend was revealed from the spectra measured at T=4.2 K in an external magnetic field i.e. E_k was found to increase with B_o. More details can be found elsewhere [3]

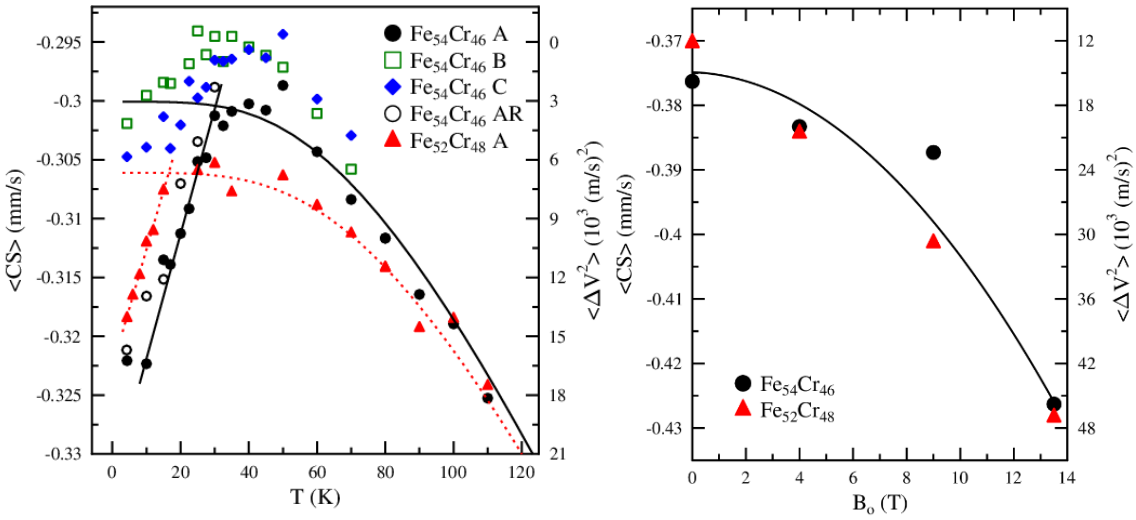

Fig. 1 The average centre shift, <*CS*>, (left panel) vs. temperature, T, as derived from the spectra recorded without applying an external magnetic field, B_o. The solid and the dashed curved lines stay for the behaviour expected for the two samples from the Debye model (DM). The skew stright lines are the best fits to the data departing from the DM. The data labelled with R were obtained from a second independent run, and those with diamonds and rectangles were obtained with different fitting procedures ; (right panel) vs. B_o. The solid line is the best parabolic fit to the data.

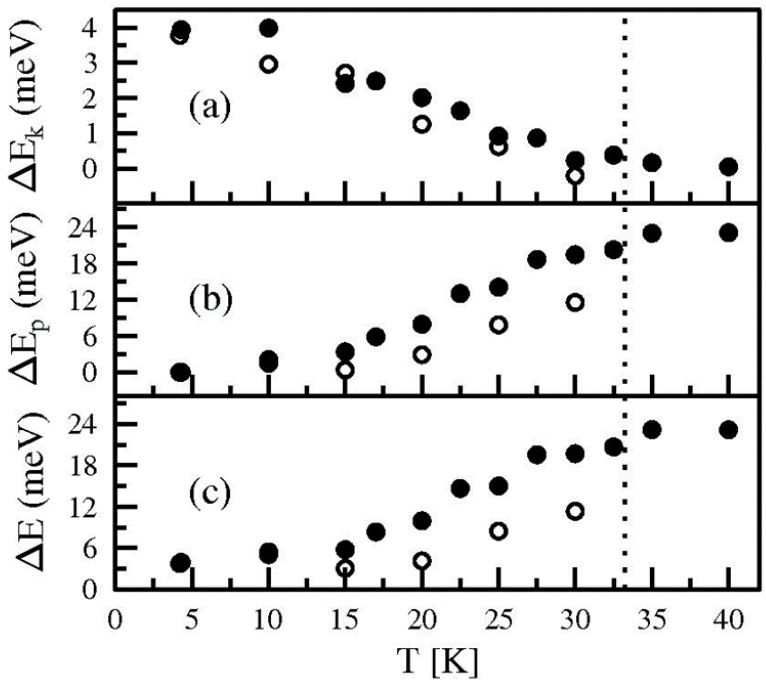

Fig. 2 (a) Changes of : (a) kinetic energy, (b) potential energy, and (c) total mechanical energy vs. Temperature, T, for $T \leq \sim T_C$. Open symbols were obtained from the repeated measurements.

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Spin filter effect at room temperature in GaN/GaMnN ferromagnetic resonant tunnelling diode

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The progress in homo- and heteroepitaxy of dilute magnetic semiconductors (DMS) allows to fabricate spintronic nanodevices, in which the spin polarization of the current can be controlled by the magnetic or electric field. The spin filter effect in a resonant tunneling diode (RTD) with paramagnetic quantum well embedded in II-VI DMS (ZnMnSe) has been experimentally demonstrated in [PRL, 90,246601]. Nevertheless the application of the paramagnetic RTD is limited to very low temperatures and requires a strong external magnetic field. These restrictions cause that more interest is directed towards the application of the ferromagnetic III-V semiconductors, especially those with high Curie temperature, e.g., GaMnAs or GaMnN. Although, the nature of the magnetic interaction in GaMnN is not completely understood, the recent experiments reported that GaMnN can exhibit the ferromagnetic properties above room temperature at which the exchange splitting of the conduction band is about several tens of meV and remains within a layer of a few nanometer width.

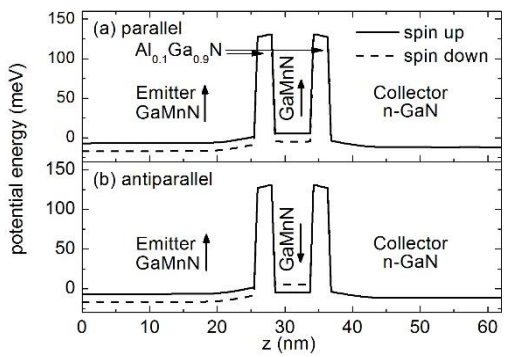

Fig.1 Self-consistent potential energy profile for spin up and spin down electrons calculated for (a) parallel and (b) antiparallel configuration.

In the present paper, we propose the AlGaN/GaMnN/AlGaN RTD structure with the ferromagnetic emitter and quantum well regions made from GaMnN (Fig. 1).

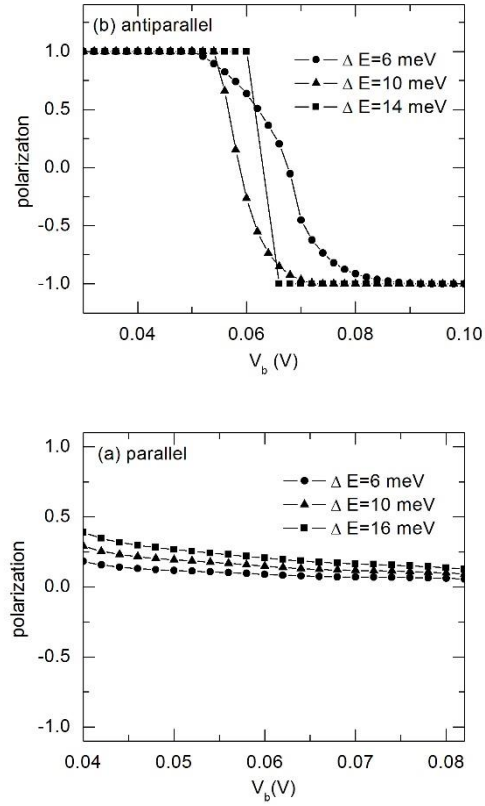

Fig.2 Spin polarization of current P as a function of bias V_b for different values of splitting energy ΔE and (a) parallel and (b) antiparallel configuration.

The ferromagnetic properties of GaMnN cause that the spin-degenerate quasi-bound state energy level in the quantum well splits into two levels for spin up and spin down electrons. Similarly, the conduction band in the ferromagnetic emitter layer is splitted into two subbands for different spins. The spin splitting of the conduction bands in the ferromagnetic layers causes that the resonance transport conditions are different for the electrons with different spins. In the

present calculations, the spin splitting energy ΔE of the conduction band is treated as a parameter that varies from 2 meV to 15 meV (the values reported in experiments).

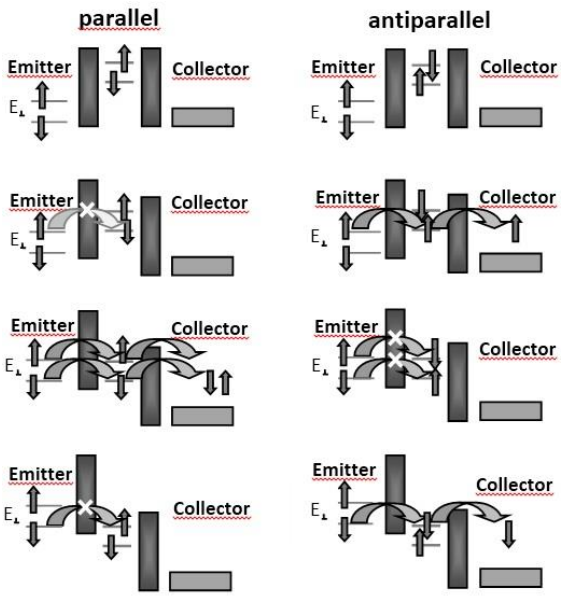

Fig. 3 Schematic illustration of spin dependent resonance tunneling of electrons in ferromagnetic RTD.

In Fig. 2, we present the spin polarization of the current as a function of the bias calculated for (a) parallel and (b) antiparallel alignments of the magnetization of the ferromagnetic layers. We see that for the parallel magnetization, the spin polarization of the current is positive at the low bias and decreases with increasing the bias. On the other hand for the antiparallel magnetization of the ferromagnetic layers, the spin polarization of the current varies from P = -1 for the low bias to P = 1 for the high bias. This dependence is observed for all values of the splitting energy ΔE, however, for the larger ΔE, the transition between the fully polarized states occurs in a narrower bias range. In order to explain strongly polarizing effect of the RTD with the antiparallel magnetization of the ferromagnetic layers, we present the simple model of the spin-dependent electron transport through the RTD for both the alignments of the magnetization (Fig. 3).

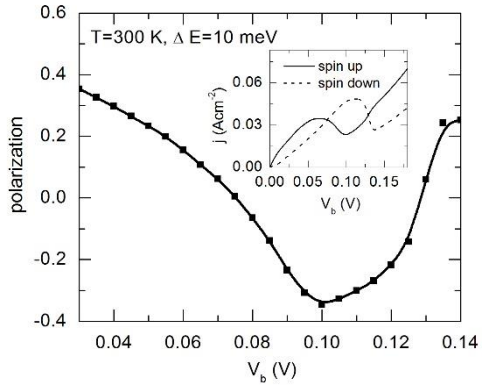

Fig. 4 Spin polarization of current as a function of bias for antiparallel alignment of the magnetization between the emitter and the quantum well at room temperature T=300K. Inset: current-voltage characteristics for spin up and spin down current components at room temperature.

Fig. 3 shows that only the anti-parallel alignment of the magnetization can lead to the full spin polarization of the current. Let us note that at room temperature, the transport window in the magnetic emitter broadens in the vicinity of the Fermi energy. This thermal effect results in the broadening of the resonant current peak for spin up and spin down current components (inset in Fig. 4). Our calculations show that for the experimentally reliable value of the splitting energy ΔE=10 meV, the spin polarization at room temperature is still quite large and reaches P=0.35 (Fig. 4). According to our knowledge this is the highest value of the spin polarization predicted at room temperature in ferromagnetic RTD up to date.

Z boson production in lead-lead collisions at the center-of-mass energy of 2.76TeV in the ATLAS experiment

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One of the primary goals of the lead-ion program at CERN is to create matter, as it would have been at the birth of the Universe. Back then, the ordinary nuclear matter of which we and the visible Universe are made could not have existed: conditions would have been too hot and turbulent for quarks to be bound up by gluons into protons and neutrons, the building blocks of the elements. Instead, these elementary particles would have roamed freely in a sort of quark gluon plasma (QGP). Showing beyond doubt that we can produce and study the QGP will bring important insights into the evolution of the early Universe, and the nature of the strong force that binds quarks and gluons together into protons, neutrons and ultimately all the nuclei of the periodic table of the elements.

The ATLAS experiment along with the CMS experiment play to the strength of their detectors, which both have very powerful and hermetic energy measuring capability. This allowed them to measure jets of particles that emerge from collisions. Jets are formed as the basic constituents of nuclear matter, quarks and gluons, fly away from the collision point. In proton collisions, jets usually appear in pairs, emerging back to back. However, in heavy-ion (HI) collisions the jets interact in the tumultuous conditions of the hot dense medium. This leads to a very characteristic signal, known as jet quenching, in which the energy of the jets can be severely degraded, signaling interactions with the medium more intense than ever seen before. Jet quenching is a powerful tool for studying the behavior of the QGP in detail. It was directly observed in the first portion of data from the HI collisions collected by the ATLAS experiment in 2010 [1].

Understanding of this phenomenon requires measuring the unmodified production rates of particles before they lose energy. The best candidates to perform such measurements are particles that do not interact via the strong force. Weak bosons decaying to leptons were identified to be perfect probes in jet-quenching related studies.

The ATLAS collaboration has done a measurement of Z boson production [2] in the entire data sample from the 2011 run, which corresponds to about 0.15nb^{-1} of lead-lead data. Z bosons were reconstructed via their electron and muon decays. Within Z boson rapidity, $|y^Z|<2.5$ and invariant mass window, $66<m_{ll}<102$GeV, a total of 772 and 1223 Z boson candidates are reconstructed in the Z→ee and Z→mumu channels, respectively. The combinatorial background estimated from same-sign di-lepton pairs is found to be at the level of 5% in the di-electron channel and 1% in the di-muon channel. The fully corrected $|y^Z|$ distribution is shown in the left panel of Fig.1. No centrality dependence of this shape is observed. The data is compared to a model composed of PYTHIA events normalized to the Z→ll cross section in proton-proton collisions at the center-of-mass energy of 2.76TeV taken from the next-to-next-to-leading order calculations [3] and scaled by a number of binary collisions. The shape is well reproduced by PYTHIA, and the integrated yield is in good agreement with the theory prediction.

The binary collision scaling of the Z boson production yields per minimum-bias collision, divided by a number of binary collisions, is shown in the right panel of Fig.1 as a function of centrality represented by a number of participants $\langle N_{part}\rangle$, in several p_T^Z bins. The figure

demonstrates that the Z→ee and Z→mumu results are consistent within their uncertainties for all p_T^Z and centrality regions. Within the statistical significance of the data sample, the Z boson per-event yield obeys binary collision scaling.

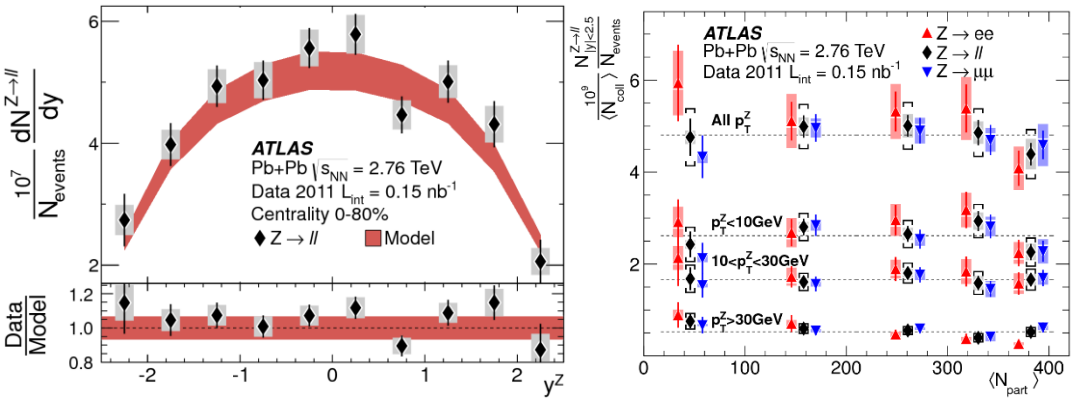

Fig.1 (left) The corrected per-event rapidity distribution of measured Z bosons. Bars and boxes represent statistical and systematic uncertainties, respectively. The data are compared to the model distribution shown as a band whose width is the normalization uncertainty. (right) Centrality dependence of Z boson yields divided by $\langle N_{coll}\rangle$. Results for electron (upward pointing triangles) and muon (downward pointing triangles) channels are shifted left and right, respectively, from their weighted average (diamonds). Bars and boxes represent statistical and systematic uncertainties, respectively. For the combined results, the brackets show the combined uncertainty including the uncertainty on $\langle N_{coll}\rangle$, and the dashed lines show the results of fits, using a constant.

The Z boson production measurement from ATLAS has been the most precise result on weak boson production in lead-lead collisions available from the experiments at the LHC so far. It confirms that indeed Z boson rates are unaffected by the strongly interacting QGP medium and as such they can be used as golden probes in investigating the jet-quenching phenomenon.

The Cracow group (INP PAS and AGH UST) has participated in ATLAS since its very beginning. We contributed to design and construction of the Inner Detector (SCT – semiconductor tracker, TRT – transition radiation tracker) and development and configuration of the ATLAS trigger system (for both proton-proton and HI collisions). Both SCT sub-detector as well as the trigger system are crucial in the HI measurements in ATLAS.

In particular the team from AGH UST had a significant contribution in coordination and preparation of a trigger selection and configuration designed for the HI run in 2011. The trigger configuration is a set of trigger selections, which are optimized to select data for physics and performance studies in real time. In 2011, the LHC machine was delivering lead-lead collisions at conditions requiring a rejection factor of 30. This implied a requirement of the careful trigger optimization, which allowed to collect a sample of high transverse momentum electrons, muons, photons and jets. The AGH UST group was playing a key role in this project, also designing and implementing core software for the ATLAS trigger system.

As far as the Z boson measurement is concerned, the AGH UST was involved in the data analysis. Also we were part of the editorial team working towards the publication in Ref. [2]. This result is part of the habilitation thesis of Iwona Grabowska-Bołd, which is in preparation now.

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The first observation of the rare leptonic decay $B_s^0 \to \mu^-\mu^+$

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The first observation of the rare leptonic decay $B_s^0 \to \mu^-\mu^+$ [1] was definitively one of the most important results obtained by the LHCb Collaboration in 2013. Since this decay is very strongly suppressed in the Standard Model (the predicted branching fraction $Br_{SM}(B_s^0 \to \mu^-\mu^+) = (3.56 \pm 0.3) \times 10^9$) it makes a perfect probe for New Physics phenomena beyond the Standard Model. The significant experimental effort has been made by both LHCb and CMS Collaborations in order to extract the signal. Neither of the experiments collected enough data to announce the discovery alone (the statistical significances of respective results were 4.0 σ for the LHCb and 4.3 σ for the CMS), therefore a decision was made to combine the data samples collected by both experiments. This allowed to claim the discovery of this decay with significance well above 5.0 σ level.
The preliminary value that has been obtained by both experiments is $Br(B_s^0 \to \mu^-\mu^+) = (2.9 \pm 0.7) \times 10^9$ (see Figure 1.).

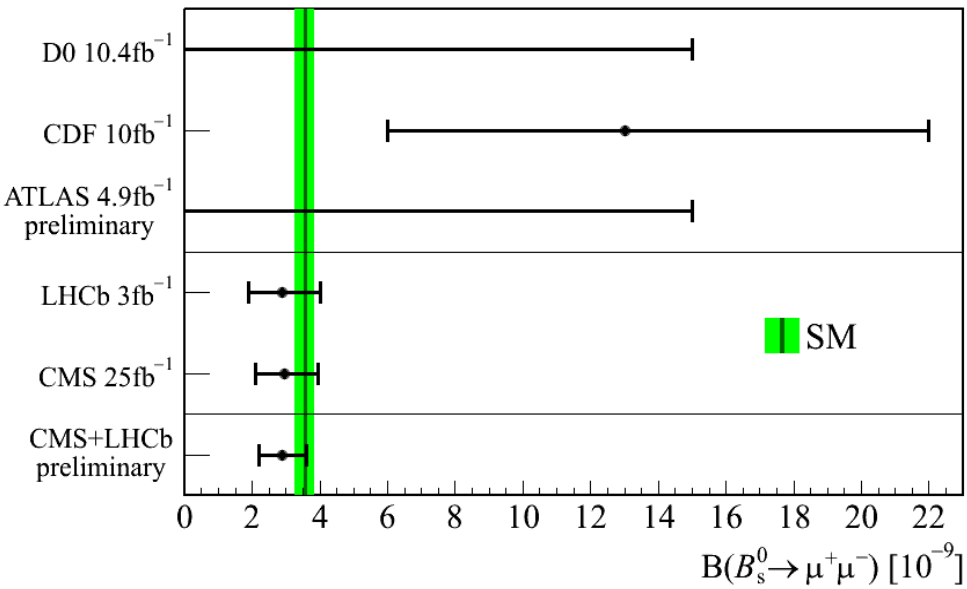

Figure 1. Preliminary results of the branching fraction measurement for the $B_s^0 \to \mu^-\mu^+$ rare decay channel performed by the LHCb and CMS Collaborations (previous measurements are shown for comparison). The Standard Model prediction is shown as a vertical line with green uncertainty band [1].

This measured branching fraction value is compatible with the predicted Standard Model one. The result does not rule out New Physics contribution, which is still possible, however, significantly constraints available parameter space. As a consequence, any theoretical model describing New Physics must comply with this observation. One should also stress that this analysis is closely related to direct Higgs studies, since, the value of

the $Br(B_s^0 \to \mu^-\mu^+)$ is particularly sensitive to theoretical models describing extended Higgs sector. The further analysis will require significant increase in data statistics which cannot be achieved without the upgrade (at the moment the radical modernisation of the LHCb spectrometer is foreseen to happen in 2019 - 2020).

The LHCb Collaboration was also able to confirm, for the very first time, non-zero *CP* violation in B_s^0 system [2]. This result is an important milestone for flavour physics and provide both very precise test of the *CKM* picture of the *CP* violation phenomenon as well as sensitive probe for New Physics (*CP* violation larger than expected theoretically would suggest new processes beyond the ones known in the Standard Model). A simple, model independent measurement of the direct *CP* violation is possible using the $B_s^0 \to K^-\pi^+$ decay (and its charge-conjugate state). The direct *CP* asymmetry can be calculated using the B_s^0 decay rate to the final state: $f_s = K^-\pi^+$ and can be defined as follow:

$$A_{CP}(B_s^0 \to f_s) = \Phi[\Gamma(\bar{B}_s^0 \to \bar{f}_s), \Gamma(B_s^0 \to f_s)]$$

where: $\bar{f}_s$ denotes the charge-conjugate final state and $\Phi[\mathbf{X},\mathbf{Y}]$ can be, in turn, written as:

$$\Phi[\mathbf{X},\mathbf{Y}] = \frac{\mathbf{X}-\mathbf{Y}}{\mathbf{X}+\mathbf{Y}}$$

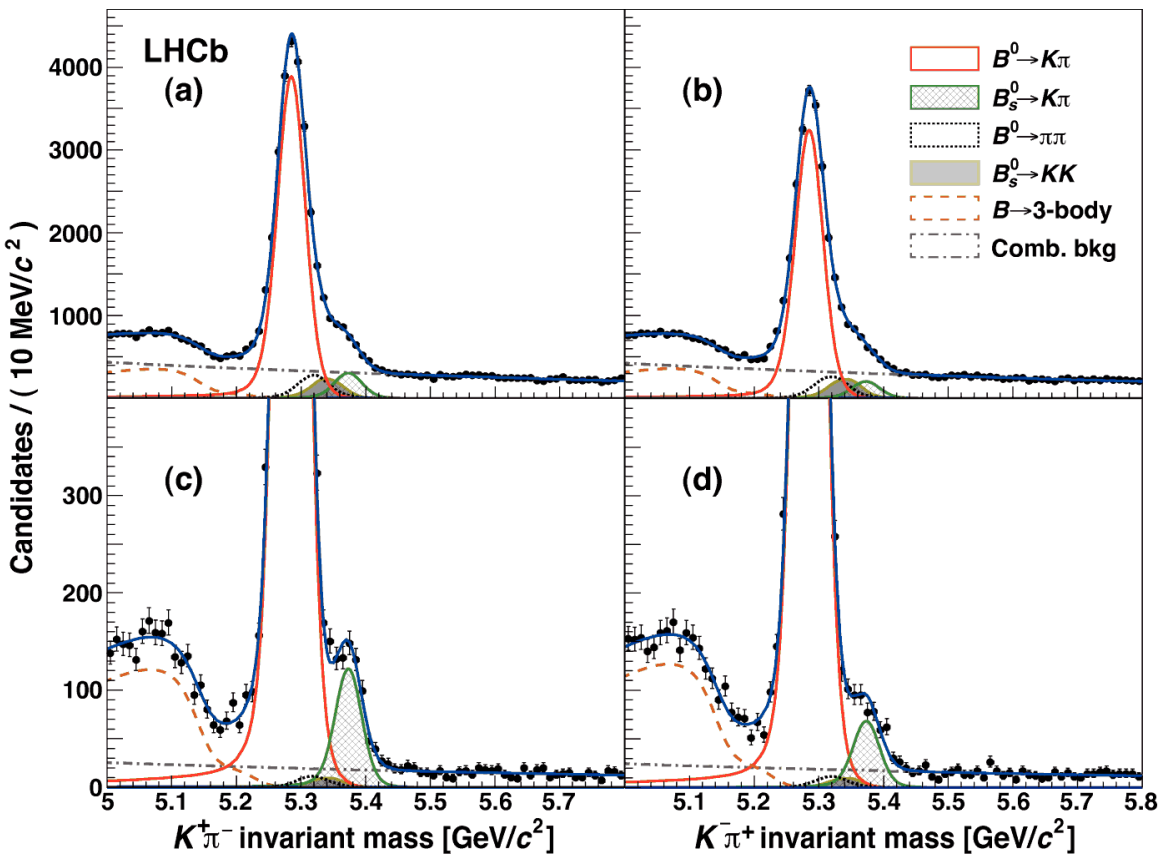

Figure 2. Invariant mass spectra obtained using selected $B_s^0 \to K^-\pi^+$ events (the selection was optimised to get the best sensitivity to A_{CP}). The asymmetry measured for the $B_s^0 \to K^-\pi^+$ decay channel is presented in figures (c) and (d). Figures (a) and (b) show the asymmetry measured for the $B^0 \to K^+\pi^-$ for comparison [2].

The mass spectra of signal events, that have been selected using an appropriately tuned algorithm, are presented in Figure 2. Subsequently, maximum likelihood mass fits can be performed and used to determine the direct asymmetry. The final result, using the 2011 data sample (corresponding to approximately yielded the asymmetry value of $A_{CP}(B_s^0 \to K^-\pi^+) = 0.27 \pm 0.04 \pm 0.01$ (where the first uncertainty is statistical and the second systematic). This result is consistent with the Standard Model predictions.

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Focal Electrical Stimulation of Major Ganglion Cell Types in the Primate Retina for the Design of Visual Prostheses

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Retinal prostheses have the potential to restore useful visual function to people blinded by retinal diseases such as retinitis pigmentosa and age-related macular degeneration. In advanced stages of disease, photoreceptors degenerate but many other retinal neurons remain, including a significant fraction of the retinal ganglion cells (RGCs) that normally transmit visual signals to the brain. Thus, vision could in principle be restored in these patients by electrically stimulating the remaining RGCs with a dense array of electrodes, in a manner that mimics the signals that a healthy retina would transmit to the brain.

Ideally, such prosthesis would recreate the healthy RGC response to a visual scene at the native spatial and temporal precision of RGCs. A critical first step is to understand how different types of RGCs respond to electrical stimulation. This is important because the primate retina contains multiple morphologically distinct RGC types, each of which sends distinct visual information to a distinct set of targets in the brain. To date, the only primate RGC types that have been shown to respond to epiretinal stimulation are the ON and OFF parasol cells which comprise 16% of the total RGC population in human retina. We probed the response properties of the five major ganglion cell types by simultaneous electrical recording and stimulation in isolated primate retina using multi-electrode arrays [2]. The results reveal that it is possible to stimulate ON and OFF midget, ON and OFF parasol, and small bistratified RGCs using ~15μm diameter electrodes with current pulses in a safe charge density range. RGCs from all five cell types exhibited similar sensitivity to brief current pulses, responding with a single, precisely timed spike, suggesting that the neural code of the retina can be reproduced with high fidelity. Furthermore, by recording simultaneously from midget and parasol cells while targeting midget cells for stimulation, we show that single-cell specificity in the highest-density cell types is achievable in many cases. Thus, in principle it is possible to safely electrically activate RGCs in the high resolution visual pathways at their native spatial and temporal resolution.

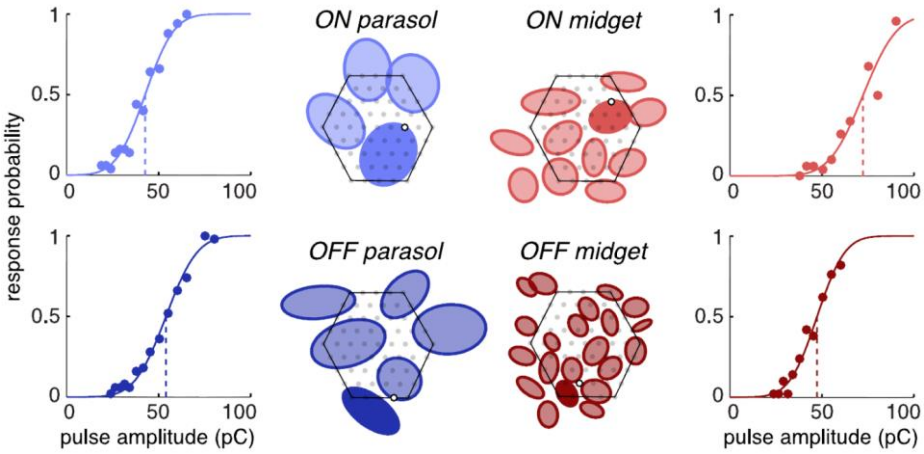

Figure 1. ON and OFF parasol and midget cells in a single preparation exhibited similar activation thresholds. Response curve of one representative cell of each type is shown. Receptive fields of cells positioned over the array are depicted as elliptical fits. Receptive fields of different cell types are plotted separately for clarity, with the array boundary indicated by the hexagonal outlines. The receptive field of the cell for which the response curve is given is indicated with a solid fill. The position of each corresponding stimulation electrode is depicted as an open black circle and the positions of the remaining electrodes are indicated with filled gray circles.

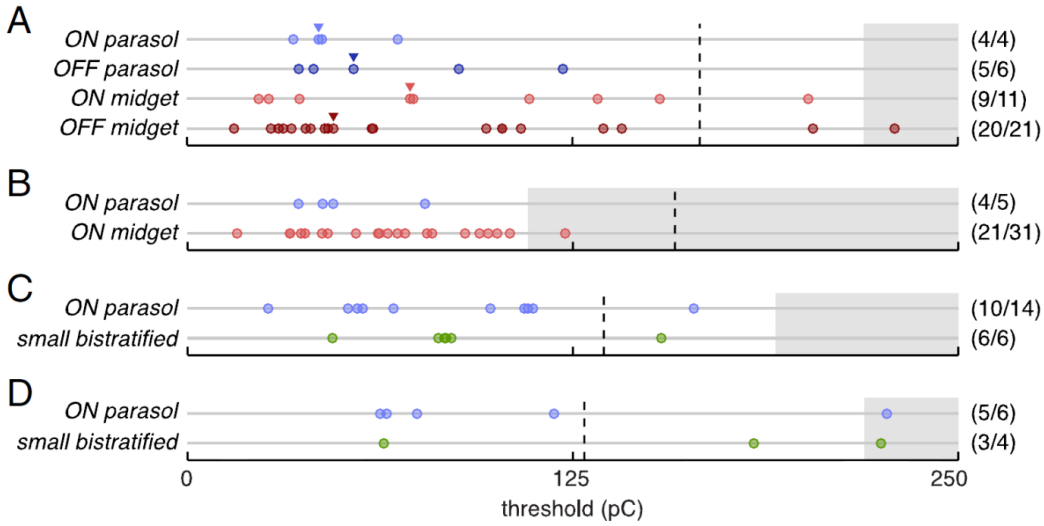

Figure 2. Comparison of measured activation thresholds of different cell types within four preparations. ***A***, Thresholds of all activated cells from the preparation represented in Figure 1. Thresholds corresponding to example response curves shown in Figure 1 are marked with triangles. ***B-D***, Measured thresholds for all cells from examined cell types in three additional retinal preparations. Values in parentheses indicate the fraction of cells lying over the array with measurable thresholds. Dashed vertical lines mark the conservative platinum charge density safety limit. Gray regions indicate untested ranges of pulse amplitudes.

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Seasonal variability of soil CO_2 flux and its carbon isotope composition in Krakow urban area, southern Poland

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The biogenic carbon dioxide emissions into the atmosphere constitute a dominating component of the global carbon cycle. On the other hand, the role of human-dominated ecosystems in regional carbon budgets escalates with progressive urbanization. This leads to increasing interest in studying CO_2 emissions in urban environment. Previous research (e.g. [1]) have shown that the increase of CO_2 concentration in the urban atmosphere is due to several factors, which can be divided into two main categories: anthropogenic and biogenic.

To characterize biogenic emissions in an urban environment, temporal variations of the soil CO_2 flux and its ^{13}C isotopic composition were investigated at two contrasting sites in Krakow agglomeration between July 2009 and May 2012. Also, spatial variability of the biogenic CO_2 flux was quantified on the plot scale. Additional research question addressed in the framework of this study was whether progressing modification of ^{13}C isotope signature of atmospheric carbon dioxide in an urban environment is seen also in the isotopic composition of the biogenic CO_2 flux from the soil.

Two sites were chosen for systematic measurements of soil CO_2 flux and its carbon isotope composition: site A located in immediate vicinity of one of the major streets in the city, and site B, located within large urban meadow, a 48-ha grassland recreation area situated close to the city centre, with limited car traffic in the direct neighborhood. The aerial distance between both sites is approximately 2km. The soil CO_2 flux and its ^{13}C isotope signature were measured using closed, dynamic chamber system coupled with infrared CO_2 sensor and flask sampling system for isotopic analysis. The air was circulated through entire system in the course of a given measurement run. The CO_2 flux from the soil was calculated using the rate of CO_2 concentration increase inside the chamber. During each measurement run two air samples were collected in glass flasks. The first flask was filled with ambient atmospheric air at the beginning of the measurement run. The second flask was filled with the air from the chamber at the end of the given measurement run. The $\delta^{13}C$ value of the soil-respired carbon dioxide was calculated using the formula derived from the isotope and mass balance equations set up for the volume of air covered by the chamber. This approach is equivalent to the use of so-called Keeling plot (see e.g. [3]; for delta notation see [4]).

To assess spatial variability of the measured soil CO_2 fluxes, a dedicated campaign was performed in October 2011. The CO_2 fluxes were measured at site B over three days with similar atmospheric and weather conditions. The mean CO_2 flux from 42 measurement points was equal 13.3±0.4 mmol m^{-2} h^{-1}. The constructed map (Fig. 1) reveals rather homogeneous distribution of the CO_2 flux.

The soil CO_2 fluxes at both investigated sites reveal a strong seasonality (Fig. 2a) induced by vegetation cycle and seasonal variations of soil temperature and water content. Minimum values of the CO_2 fluxes were recorded during winter months (typical CO_2 fluxes measured during winter varied between approximately 1 and 5 mmol m^{-2} h^{-1} for both sites). During the vegetation period the CO_2 fluxes increase, reaching maximum values of 25-30 mmol m^{-2} h^{-1} at site A and 40-50 mmol m^{-2} h^{-1} at site B.

As anticipated, the measured $\delta^{13}C$ values of atmospheric CO_2 were slightly lower

at site A, where heavy car traffic is permanently present in a close vicinity of the plot where flux measurements were performed (Fig. 2b). A clear seasonal cycle of atmospheric $\delta^{13}CO_2$ at both sites is visible, with minimum values occurring during winter when anthropogenic sources of CO_2 are much stronger.

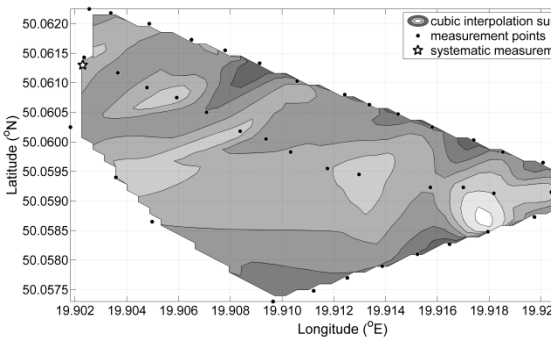

Fig. 1. Spatial variability of soil CO_2 flux at site B. Black points represent measured values.

It is expected that fossil-fuel signature in the plant-assimilated CO_2 should be imprinted in the soil CO_2 flux. Thus, the soil CO_2 released at site A should contain less ^{13}C than that released at site B. The carbon isotopic signature of soil CO_2 calculated using Keeling plot has fluctuated at both sites without apparent seasonality (Fig. 2c). Within the reported standard uncertainty, the mean $\delta^{13}C$ values are non-distinguishable. This surprising result may originate from several effects: (i) episodic character of the measurements, (ii) a distinct link between the photosynthetic activity of plants and the intensity of vertical mixing of the local atmosphere, leading to preferential "sampling" of the atmospheric CO_2 by local vegetation during periods of intense mixing, and (iii) long residence time of carbon in the soil reducing isotope variability of the input signal.

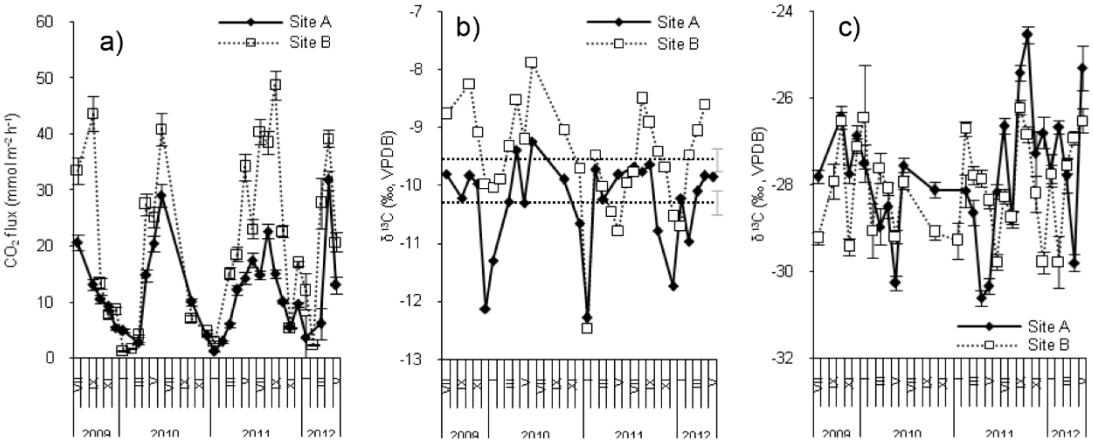

Fig. 2. Seasonal variability of a) CO_2 flux; b) $\delta^{13}C$ of atmospheric CO_2; c) $\delta^{13}C$ in soil-respired CO_2 at at site A (closed diamonds, solid line) and site B (open squares, dotted line) measured during the period July 2009 – May 2012.

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Collective flow in small systems

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Deuteron-gold collisions at the BNL Relativistic Heavy Ion Collider and proton-lead collisions at the CERN Large Hadron Collider have been recently studied. The original motivation to perform these experiments was to obtain reference data using collisions systems without collective flow in the final state. Interestingly, the measurements [1-4] are consistent with predictions of a hydrodynamic model assuming the existence of a collective expansion stage [5]. The experiments observe larger elliptic flow in d-Au collisions than in p-Pb collisions. It is in agreement with theoretical expectations, as the initial fireball in d-Au interactions has a large eccentricity due to the quadrupole deformation of the intrinsic deuteron wave function [5].

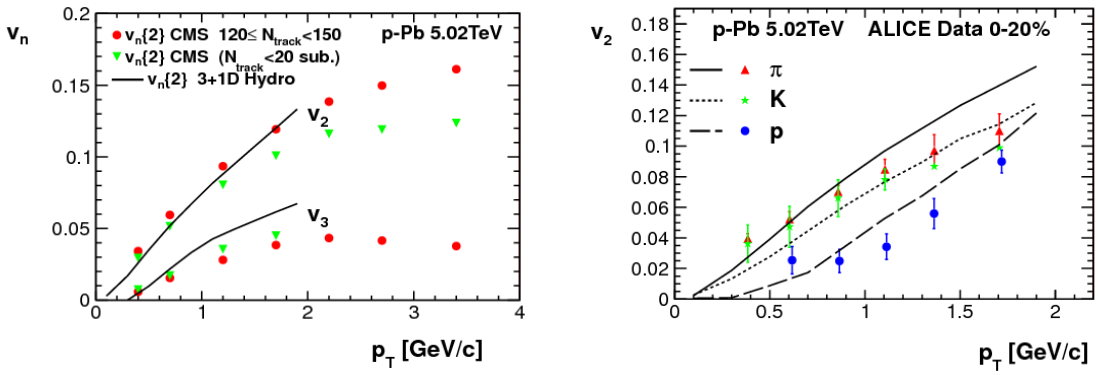

Fig. 1 (left panel) Elliptic and triangular flow coefficients of charged particles from the hydrodynamic model (lines) compared to CMS results [1] (symbols). Elliptic flow of pions, kaons, and protons from the hydrodynamic model (lines) compared to ALICE results [4] (symbols). (from [7])

Fluctuations of the shape of the fireball formed in p-Pb collisions yield non-zero second and third harmonics of the azimuthal distribution. The collective flow field is asymmetric in the azimuthal directions and the spectra of emitted particles show noticeable elliptic and triangular flow coefficients (Fig.1, left panel). Collectivity manifests itself in the dependence of the elliptic flow coefficient on the particle mass. Hydrodynamic calculations for A-A collisions show a mass hierarchy of the momentum dependent flow coefficients. The elliptic flow is larger for pions than for protons, in agreement with the experiment. The same mechanism causes a mass hierarchy of the elliptic flow of identified particles emitted in p-Pb interactions (Fig.1, right panel). The experimental results of the ALICE Collaboration [6] show a pion-proton splitting of v_2 in fair agreement with the model calculations. The momenta of particles emitted from a fluid element moving with a collective velocity have two components, the flow field and the thermal component. Heavier particles gain a stronger collective component. As a result, the average transverse momentum increases with the particle mass. The strength of the mass hierarchy in the average transverse momentum can serve a measure of the amount of accumulated transverse flow. In Fig. 2 are shown the average transverse momentum calculated in two different models. In the HIJING model par-

ticle production in p-Pb collisions is described as a superposition of the emission from individual N-N collisions, without any collective flow component, the experimental results cannot be reproduced. On the other hand, the hydrodynamic model reproduces the ALICE Collaboration data fairly well, both the average transverse momentum, as well as its dependence on the particle mass.

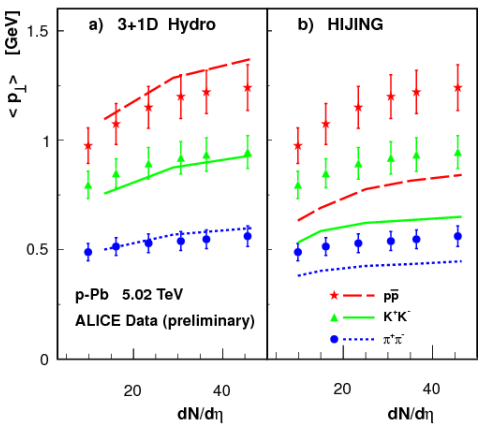

Fig. 2 Mean transverse momentum of identified particles as a function of the charged particle density in p-Pb collisions, following from hydrodynamics (a) and HIJING 2.1 (b). The lines show the model calculations, while the data points represent ALICE results [6]. (from [7])

The color glass condensate approach predicts similar angular correlations [8]. To disentangle the two models, we have proposed to look at the rapidity dependence of the average transverse momentum in p-Pb collisions [9]. When going to the proton side, the size of the fireball decreases, its expansion is shorter, and the hydrodynamic model predicts a decrease of the average transverse momentum with rapidity. On the other hand, the saturation scale in the color glass condensate framework increases on the proton side, this scale determines the average momentum of emitted particles.

The spectra of identified particles in p-Pb collisions are calculated in the relativistic viscous hydrodynamic model. The model predicts a mass dependence of the average transverse momenta and of the harmonic flow coefficients in fair agreement with experimental measurements.

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Crystal structure and Curie temperature of $Tb_{0.27}Dy_{0.73}(Fe_{0.7-x}Ni_xCo_{0.3})_2$ compounds

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The intermetallic compounds RM_2 with a C15 cubic Laves phase structure have been studied at great length for their fundamental interest and practical applications [1]. Recently, RM_2 intermetallics have been applied as magnetostrictive ingredients of novel materials with a giant magnetoelectric effect [2]. It has been found that, as with Fe–Co alloys, the magnetic hyperfine field observed in ^{57}Fe nuclei in substituted $Tb_{0.27}Dy_{0.73}(Fe_{1-x}Co_x)_2$ intermetallics, treated as a function of the average number n of 3d electrons, behave analogously to a Slater–Pauling dependence [3]. A maximum values of the magnetic hyperfine field and Curie temperature are observed for the $Tb_{0.27}Dy_{0.73}(Fe_{0.7}Co_{0.3})_2$ compound [3,4]. This compound is a starting compound of the studied series $Tb_{0.27}Dy_{0.73}(Fe_{0.7-x}Ni_xCo_{0.3})_2$.

The intermetallics $Tb_{0.27}Dy_{0.73}(Fe_{0.7-x}Ni_xCo_{0.3})_2$ were prepared with an arc melting system, with a contactless ignition, in a high purity argon atmosphere. The synthesized ingots were then annealed in a vacuum (10^{-6} Pa) at 1123 K for 2h and allowed to cool down along with the furnace to approximately 250 K/h. Analysis of the X-ray diffraction patterns revealed that the samples are single-phase of Laves, Fd3m, $MgCu_2$-type, and of a cubic structure. The crystal unit cell parameters a obtained for the studied series are presented in Fig. 1. Since the atomic radius of Fe atom is higher than the corresponding radius of Ni atom [5], unit cell parameter a decreases almost linearly with the nickel content.

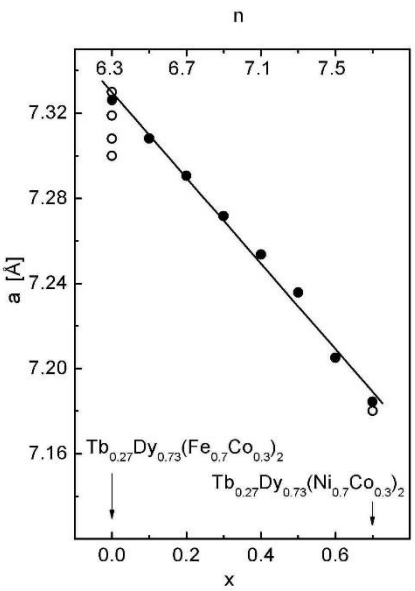

Fig.1. The unit cell parameter a, determined for the $MgCu_2$-type structure of the intermetallics $Tb_{0.27}Dy_{0.73}(Fe_{0.7-x}Ni_xCo_{0.3})_2$ (300K).

Data found in the literature for $Tb_{0.27}Dy_{0.73}(Fe_{0.7}Co_{0.3})_2$ and $Tb_{0.27}Dy_{0.73}(Ni_{0.7}Co_{0.3})_2$ compounds coincide satisfactorily with the obtained experimental data [4] (open points). In practice Vegard's rule is obeyed.

The electrical resistivity (not presented) has been used to determine Curie temperatures. The electrical resistivity ρ observed for magnetic metals can be described by the Matthiesen formula:

$\rho = \rho_0 + \rho_f + \rho_m$, where ρ_0 is the residual resistivity, ρ_f is the phonon contribution, and ρ_m is the magnetic contribution [6].

A method based on the $\rho_m(T)$ dependence was used to determine the magnetic ordering temperatures of the intermetallic series studied here [7]. Namely, the magnetic ordering

temperature T_C is situated in a temperature range with the maximal change of numerically estimated parameter $\delta\rho_m(T)/\delta T$ as presented in the inset of Fig. 2 for the compound with x=0.

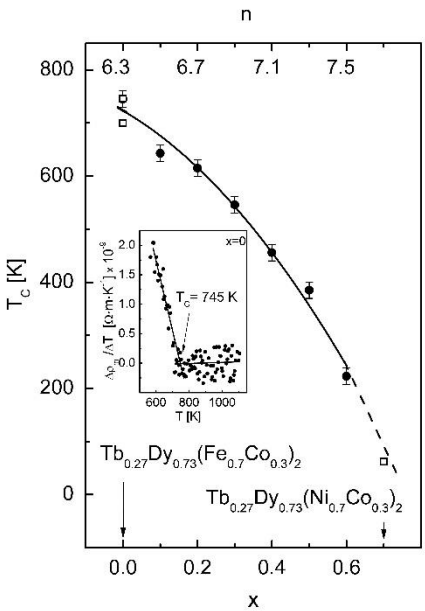

Fig. 2 The Curie temperatures T_C of the $Tb_{0.27}Dy_{0.73}(Fe_{0.7-x}Ni_xCo_{0.3})_2$ series against the nickel content x. Open marks denote literature data [4]. Inset: $\delta\rho_m(T)/\delta T$ functions of T for the $Tb_{0.27}Dy_{0.73}(Fe_{0.7}Co_{0.3})_2$ compound.

The intersection of the two fitted straight lines determines the magnetic ordering temperature. The experimental error depends on the quality of the $\delta\rho_m(T)/\delta T$ dependence and the maximal error in this case can be estimated as $\delta T_C \approx 13$K. The Curie temperatures for the $Tb_{0.27}Dy_{0.73}(Fe_{0.7-x}Ni_xCo_{0.3})_2$ series are presented in Fig. 2. The relatively high ordering temperature for $Tb_{0.27}Dy_{0.73}(Fe_{0.7}Co_{0.3})_2$ (745 K) shows a further nonlinear, strong decrease with the nickel content.

In summary, the unit cell parameter a and the Curie temperature T_C decrease considerably as results of the Fe/Ni substitution, or results of an increase of the number n of 3d-electrons, across the studied series.

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New developments of multireflection grazing incidence diffraction

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The MGIXD (multireflection grazing incident X-ray diffraction) is one of the methods used for determination of in-depth stress distribution. Such measurement is possible through the use of a small angle between incidence beam and sample surface, and consequently constant penetration depth of X-ray radiation in the studied material [1,2]. The information depth can be changed by setting different angles of incidence. The MGIXD method has very important advantages in comparison with other diffraction methods of stress determination. The important feature of this method is that the lattice strains are measured in different crystallographic direction and next simultaneously used in analysis. This enables the study of the elastic anisotropy and the choice of the appropriate model of grains interaction for the interpretation of the experimental results. Furthermore not only stresses but also strain free a_0 and c/a (for hexagonal structure) parameters and their in-depth variation can be determined. Finally, the gradients of the root mean square strain $\sqrt{<\varepsilon^2>}$ and crystallite size (coherent domain) can be studied using Williamson-Hall method [3].

In this work the MGIXD was developed and applied to measure in-depth stress distributions in coatings and surface layers of materials subjected to different mechanical treatments. The method of c/a parameter determination was proposed for hexagonal samples and the influence of stacking faults on the analysis of experimental data was taken into account [4]. The stresses, strain free parameter a_0 as well as c/a value were determined using self-consistent iteration method proposed in this work. Significantly better fitting of the theoretical values to experimental ones was obtained when c/a was adjusted. Moreover the mechanical properties of the polycrystals such as: elastic anisotropy of elastic constants and grain interactions were investigated. It was found that Reuss and free surface grain interaction models are in the best agreement with the experimental results [4,5].

The modified MGIXD method was used for the interpretation of the data obtained with low and high energy synchrotron radiation. In the first experiment performed at G3 spectrometer (DESY, Hamburg) three different wavelengths (energies) of radiation were used in MGIXD method [4,6]. As the result almost the same in-depth stress and strain free lattice parameters a_o were obtained for all applied wavelengths (Fig. 1).

For the first time the proposed multireflection method (data selected for the same penetration depth) was successfully used to analyze the data obtained with high energy synchrotron radiation (EDDI beamline at BESSY synchrotron, Berlin). In this case the energy dispersion technique was used. A very good agreement was obtained between the stresses measured using synchrotron radiation as well as Cu K_α radiation on the laboratory PANalitical X'Pert diffractometer [4]. The great advantage of using high-energy synchrotron radiation was the possibility to measure stresses for larger depths in comparison with laboratory X-rays (Fig. 2).

Summarizing, it can be stated that MGIXD method is an indispensable tool to study the distribution of stresses, strain free parameter a_0 as well as c/a value in the surface layers, but the applicability of this method is limited by factors such as the anisotropy of elastic constants. It should be also underlined, that the reliable diffraction stress analysis is only possible when an appropriate grain interaction model is applied in calculation of XEC (X-ray elastic constants) for anisotropic sample [6].

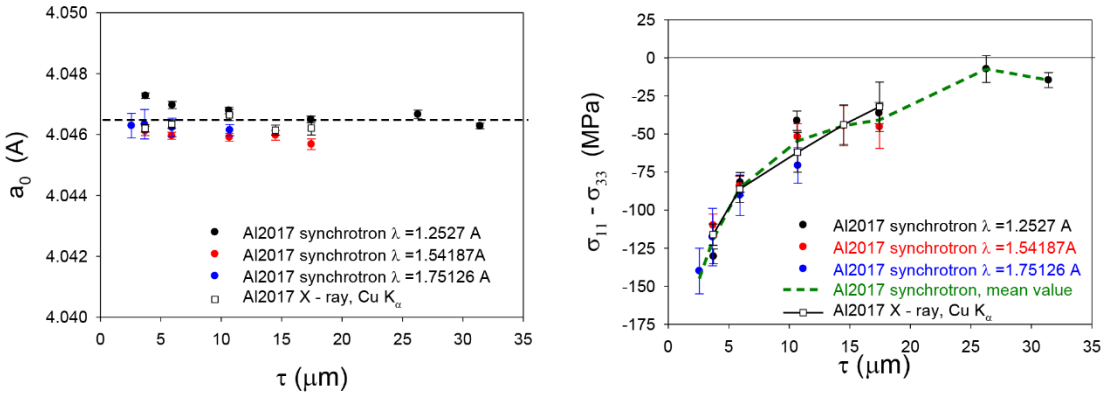

Fig. 1. The in-depth profiles of stresses and a_0 lattice parameter for polished Al alloy (Al2017). The results for different wavelengths of synchrotron radiation and for laboratory diffractometer (Cu Kα radiation) are shown.

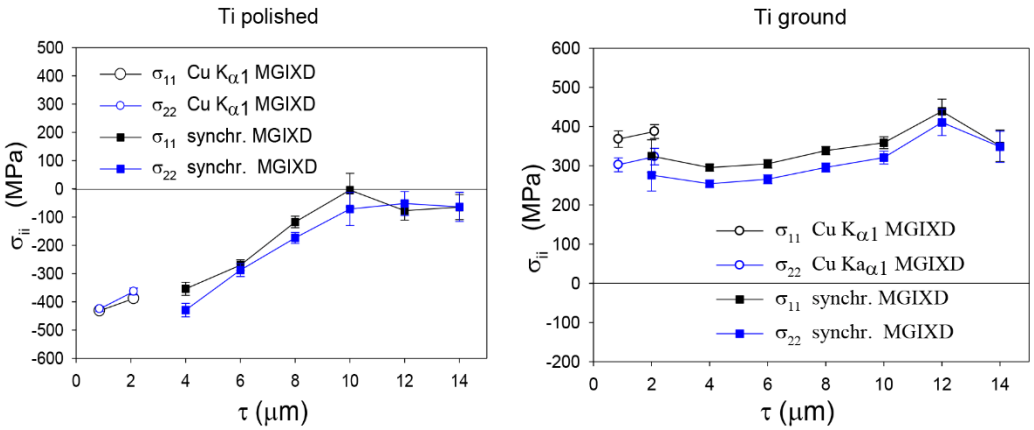

Fig. 2. The in-depth profile of stresses for polished and ground Ti samples. Comparison of the results obtained from classical diffractometer (Cu Kα radiation) and synchrotron experiment (energy range 40-68 KeV).

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Third-party funds
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ZLECENIA DOTYCZĄCE
ZAGRANICZNYCH PROJEKTÓW BADAWCZYCH

Nr umowy	Kierownik	Temat	Czas trwania
4.4.220.7047 Współpraca Polsko-Norweska	Joanna Czub	Nanomaterials for hydrogen storage.	18.09.13 28.02.15

ZLECENIA Z PRZEMYSŁU

Nr umowy	Kierownik	Temat	Czas trwania
5.5.220.752	Andrzej Bolewski	Badanie makroskopowego przekroju czynnego absorpcji neutronów termicznych dla wyrobów grafitowych oraz obliczenie równoważnika borowego BE dla: Zakładu RBZ – 5 badań, Zakładu NSZ – 8 badań.	01.02.13 15.12.13
5.5.220.754	Paweł Jodłowski	Badanie radioaktywności wyrobów węglowych i grafitowych w 2013 roku dla: SGL Carbon	02.02.13 15.12.13
5.5.220.759	Paweł Jodłowski	Pomiar koncentracji pierwiastków promieniotwórczych w popiołach z Kotłowni w Arcelor Mittal	25.04.13 15.12.13
5.5.220.761	Marek Duliński	Badanie składu izotopowego wodoru i tlenu oraz stężenia trytu w solankach z wycieków Kopalni Soli „Wieliczka” pobranych w 2013 roku.	06.05.13 30.07.13
5.5.220.763	Marek Duliński	Opracowanie i wykonanie badań na zawartość trytu w wodach porowych dla ok. 55 próbek gruntu.	05.06.13 15.12.13

ZLECENIA Z INNYCH UCZELNI

Nr umowy	Kierownik	Temat	Czas trwania
6.18.220.751	Sebastian Wroński	Wykonanie pomiarów tomograficznych próbki Mg.	13.02.13 25.02.13

ZLECENIA Z INSTYTUCJI ZAGRANICZNYCH (EKSPORT)

Nr umowy	Kierownik	Temat	Czas trwania
13.13.220.84320	Marek Lankosz	Ilościowe obrazowanie map pierwiastków metodą rentgenowskiej mikroskopii fluorescencyjnej.	19.04.10 31.05.13
13.13.220.84590	Jarosław Nęcki	Ciągłe pomiary atmosferycznego stężenia dwutlenku węgla i metanu na stacji Kasprowy Wierch.	02.01.11 30.06.13
13.13.220.84940	Jan Kulka	Konsolidacja i modernizacja sieci zasilającej – Zachodni Rejon CERN – w Meyrin.	02.01.12 31.12.14
13.13.220.84950	Jan Kulka	Konsolidacja i unowocześnienia systemów Instrumentacji i sterowania kriogeniką i próżnią akceleratora LHC i jego systemów napełniania.	02.01.12 31.12.14
13.13.220.84960	Jan Kulka	Miernictwo geodezyjne i pozycjonowanie.	02.01.12 31.12.14
13.13.220.85100	Jan Kulka	Konsolidacja i modernizacja sieci zasilania energetycznego siedziby CERN w Prevessin.	01.03.12 31.12.14
13.13.220.85110	Jan Kulka	Konsolidacja i modernizacja sieci zasilania energetycznego rejonu głównych budynków siedziby CERN w Meyrin.	01.03.12 31.12.14
13.13.220.85120	Jan Kulka	Konsolidacja i modernizacja systemu ochrony magnesów nadprzewodnikowych LHC w trakcie pierwszej długiej przerwy technologicznej LHC.	01.03.12 31.12.14

13.13.220.85300	Władysław Dąbrowski	Opracowanie systemu elektroniki front-end do stymulacji i odczytu sygnałów 64-klatkowej matrycy.	24.05.12 31.07.14
13.13.220.85680	Kazimierz Różański	Wykonanie badań zawartości trytu w 36 próbach wód podziemnych.	22.20.12 31.01.13
13.13.220.85690	Kazimierz Różański	Szkolenie stypendysty z Ghany.	15.10.12 10.02.13
13.13.220.86150	Jan Kulka	Współpraca na doradztwo techniczne w zakresie sprzętu elektrycznego i elektronicznego obwodów nadprzewodzących podczas pierwszej przerwy technologicznej akceleratora LHC.	20.02.13 28.02.15
13.13.220.86170	Jan Kulka	Konsolidacja i modernizacja systemów ochrony elektronicznej i stowarzyszonych urządzeń dla nadprzewodnikowych magnesów LHC podczas pierwszego długiego wyłączenia (LS1) LHC.	27.02.13 31.10.14
13.13.220.86240	Władysław Dąbrowski	Detektory drugiej generacji z polepszoną rozdzielczością energetyczną oparte na technologii krzemowej.	15.04.13 31.12.14
13.13.220.86350	Kazimierz Różański	Wykonanie badań składu izotopowego próbek wód podziemnych.	22.05.13 31.08.13
13.13.220.86360	Kazimierz Różański	Wykonanie badań składu izotopowego próbek wód podziemnych.	23.05.13 31.08.13
13.13.220.86380	Jan Kulka	Rozwój oprogramowania, sterowania akceleratorami.	24.05.13 31.05.16
13.13.220.86440	Kazimierz Różański	Wykonanie badań składu izotopowego próbek wód podziemnych.	10.07.13 31.10.13
13.13.220.86450	Kazimierz Różański	Wykonanie badań składu izotopowego próbek wód podziemnych.	10.07.13 30.10.13

13.13.220.86490	Kazimierz Różański	Wykonanie kompletnego systemu elektrolitycznego wzbogacania próbek wody do pomiarów niskich stężeń trytu w próbkach wody.	22.08.13 31.05.14
13.13.220.86500	Kazimierz Różański	Instalacja elektrolitycznego systemu wzbogacania prób wody do pomiarów niskich aktywności trytu oraz przeprowadzenie szkolenia personelu.	22.08.13 01.09.14
13.13.220.86750	Kazimierz Różański	Wykonanie badań składu izotopowego próbek wód podziemnych.	03.12.13 31.01.14
13.13.220.86760	Kazimierz Różański	Wykonanie badań składu izotopowego próbek wód podziemnych.	03.12.13 31.01.14
13.13.220.86770	Kazimierz Różański	Wykonanie badań składu izotopowego próbek wód podziemnych.	03.12.13 31.01.14
13.13.220.86810	Nguyen Dinh Chau	Odbywanie stażu przez P. Aloyce Isaya Amasi z Międzynarodowej Agencji Energii Atomowej w Wiedniu w okresie 21.10.2013 – 20.10.2014 r.	21.10.2013 20.10.2014
13.13.220.86860	Kazimierz Różański	Wykonanie badań zawartości trytu w 31 próbach wód podziemnych.	10.01.14 31.03.14

ZLECENIE Z INNYCH WYDZIAŁÓW

Nr umowy	**Kierownik**	**Temat**	**Czas trwania**
14.11.220.750	Paweł Jodłowski	Wykonanie badania promieniotwórczości naturalnej 6 próbek popiołów ze spalania osadów ściekowych o kodach 19 01 14 oraz 19 01 07.	21.01.13 25.02.13
14.18.220.765	Marek Duliński	Wykonanie analiz izotopowych próbek wód chlorkowych.	16.07.13 30.11.13

DOFINANSOWANIE MŁODYCH NAUKOWCÓW Z MNISW

Nr umowy	Kierownik	Temat	Czas trwania
15.11.220.717	Andrzej Kreft	Dofinansowanie prowadzenia badań naukowych służących rozwojowi uczestników studiów doktoranckich. (22 zadania)	02.01.11
15.11.220.718	Stanisław Bednarek	Dofinansowanie prowadzenia badań naukowych służących rozwojowi młodych naukowców. (6 zadań)	02.01.11
15.11.220.760	Marek Duliński	Dofinansowanie prowadzeniu badań naukowych służących rozwojowi uczestników studiów doktoranckich polegające na zakupieniu aparatury naukowo-badawczej niezbędnej do wykonania pracy.	08.05.13 31.12.13

GRANTY NCN/ MNISW

Nr umowy	Kierownik	Temat	Czas trwania
18.18.220.690	Marek Lankosz	Badania wybranych pierwiastków śladowych i biomolekuł w glejowych nowotworach mózgu i ich otoczeniu w relacji do stopnia złośliwości guza.	09.10.09 08.10.13
18.18.220.697	Bartłomiej Szafran	Symulacje magnetotransportu w nanostrukrurach półprzewodnikowych.	17.03.10 16.03.13
18.18.220.703	Łukasz Gondek	Właściwości fizyko-chemiczne i charakterystyka aplikacyjna wodorków związków międzymetalicznych ziem rzadkich.	08.04.10 07.07.14
18.18.220.707	Jarosław Nęcki	Oszacowanie bilansu wodoru w atmosferze Polski Południowej na podstawie danych pochodzących z pomiarów stężenia i składu izotopowego wodoru Na Kasprowym Wierchu, Krakowie i wybranych punktach Podhala i Górnego Śląska.	30.09.10 29.09.13

18.18.220.716	Janusz Wolny	Struktura i własności fizyczne kwazikryształów i układów międzymetalicznych o gigantycznej komórce elementarnej.	11.04.11 10.04.14
18.18.220.722 IUVENTUS PLUS	Joanna Chwiej	Biochemiczne podłoże zmian neurodegeneracyjnych w epileptycznym mózgu szczura.	01.01.11 31.08.14
18.18.220.726 PRELUDIUM	Magdalena Kaczmarska	Badanie korelacji między strukturą szkieletu błonowego oraz przepuszczalności 02 i Na+ /K+ czerwonych ciałek krwi pacjentów z nadciśnieniem.	07.12.11 06.12.13
18.18.220.727 PRELUDIUM	Katarzyna Senderowska	Badanie łamania symetrii CP w rozpadach mezonów BSo do stanów końcowych zawierających cząstkę wektorową i pseudo-skalarną w eksperymencie LHCb.	13.12.11 12.04.13
18.18.220.728 PRELUDIUM	Paweł Kuczera	Badania dyfrakcyjne i analiza strukturalna dekagonalnych kwazikryształów z rodziny Cu-Me (Me=Co, Rh, Ir).	12.12.11 11.12.13
18.18.220.729	Krzysztof Wierzbanowski	Badanie procesu walcowania asymetrycznego metali o sieci regularnej i heksagonalnej w aspekcie uzyskiwania struktury ultra-drobnoziarnistej.	15.12.11 14.12.14
18.18.220.730	Sebastian Wroński	Badanie mechanizmów deformacji i rekrystalizacji w materiałach o strukturze heksagonalnej.	14.12.11 13.12.15
18.18.220.731	Przemysław Wachniew	Opracowanie i weryfikacja nowej metodyki oznaczania koncentracji ołowiu Pb-210 w osadach, glebach i torfach za pomocą spektrometrii gamma na potrzeby badań środowiskowych.	02.01.12 20.12.14

18.18.220.735 MAESTRO	Janusz Toboła	Badania wpływu domieszek rezonansowych i konwencjonalnych na własności termoelektryczne z uwzględnieniem efektów relatywistycznych.	30.04.12 30.04.17
18.18.220.737 MAESTRO	Józef Korecki	Oligo-atomowe supersieci metal-tlenek jako nowe materiały o dostrajalnych właściwościach elektrycznych i magnetycznych.	27.04.12 27.04.16
18.18.220.739	Janusz Adamowski	Symulacje komputerowe zależnego od spinu transportu elektronowego w półprzewodnikowych drutach kwantowych.	07.08.12 06.08.15
18.18.220.742 PRELUDIUM	Paweł Szumniak	Teoretyczne badanie dynamiki spinowej solitonów elektronowych i dziurowych w nanourządzeniach półprzewodnikowych mających znaleźć zastosowanie w obliczeniach kwantowych.	17.0912 16.09.13
18.18.220.743 PRELUDIUM	Kamil Kutorasiński	Badanie wpływu własności elektronowych stopów wieloatomowych na efektywność konwersji energii w zjawiskach termoelektrycznych.	24.0912 23.09.14
18.18.220.749 OPUS	Bartłomiej Szafran	Modelowanie transportu ładunku w nanostrukturach półprzewodnikowych z bramką skanującą.	25.01.13 24.01.16
18.18.220.753 OPUS	Jakub Cieślak	Badania własności fazy sigma w układach trójskładnikowych zawierających żelazo.	04.02.13 03.08.15
18.18.220.755 PRELUDIUM	M.Gałkowski	Zmienność czasowa i przestrzenna podtlenku azotu w atmosferze południowej Polski: oszacowanie regionalnych stężeń iraz strumieni N20.	06.03.13 05.03.16
18.18.220.762 OPUS	Mariusz Przybycień	Badanie dyfrakcji, fotoprodukcji i nowej fizyki z wykorzystaniem tagerów protonów w przód w eksperymencie ATLAS na LHC.	27.05.13 15.05.16

18.18.220.767 PRELUDIUM	Krzysztof Misztal	Identyfikacja osób na podstawie tęczówki oka w zmiennych warunkach środowiskowych.	08.07.13 07.07.16
18.18.220.768 OPUS	Marek Idzik	Projekt nowatorskiego wielokanałowego układu konwersji analogowo-cyfrowej z szybką serializacją danych, o ultra niskim poborze mocy, z wykorzystaniem zaawansowanych submikronowych technologii CMOS.	23.07.13 07.07.16
18.18.220.770 OPUS	Marek Idzik	Projektowanie nowatorskich detektorów pikselowych w technologii SOI dla fizyki cząstek.	12.08.13 24.07.16
18.18.220.771 PRELUDIUM	Wojciech Pasek	Charakterystyka ładowania i zachowania skorelowane w dziurowych sztucznych atomach.	29.08.13 28.08.15

GRANTY NA UTRZYMANIEM SPECJALNEGO URZĄDZENIA BADAWCZEGO

Nr umowy	**Kierownik**	**Temat**	**Czas trwania**
20.11.220.764	Kazimierz Różański	Stacja pomiaru składu atmosfery KASLAB na Kasprowym Wierchu w 2013 r.	14.06.13 30.06.14

SPUB – M.

Nr umowy	**Kierownik**	**Temat**	**Czas trwania**
22.22.220.7028	Wiesława Sikora	Złożony system socjotechniczny w inteligentnym środowisku.	01.02.09 31.01.13
22.22.220.7039	Marek Idzik	Zaawansowane europejskie infrastruktury dla detektorów przy akceleratorach.	28.12.11 31.01.15
22.22.220.7043	Jarosław Nęcki	Zintegrowana sieć pomiarów gazów cieplarnianych (z wyłączeniem CO2).	08.08.12 30.09.15
22.22.220.7046	Bartłomiej Szafran	Edukacja w zakresie nanotechnologii dla przemysłu i społeczeństwa.	01.05.13 30.10.15

PROGRAMY EUROPEJSKIE

Nr umowy	Kierownik	Temat	Czas trwania
27.27.220.7024 SOCIONICAL	Wiesława Sikora	Complex Socio-Technical System in Ambient Intelligence	01.02.2009-31.01.2013
27.27.220.7034 EURATOM	Stanisław Dubiel	Radiation Effects Modelling and Experimental Validation	01.01.2010-31.12.2013
27.27.220.7035 AIDA	Marek Idzik	Advanced European Infrastructures for Detectors at Accelerators	01.02.2011-31.01.2015
27.27.220.7040 InGOS	Jarosław Nęcki	Integrated non-CO2 Greenhouse gas Observation System	01.10.2011-30.09.2015
27.27.220.7044 NanoEIS	Bartłomiej Szafran	NanoEIS - Nanotechnology Education for Industry and Society	01.11.2012-31.10.2015
502.220.2001 ISD	Janusz Adamowski	Interdyscyplinarne Studia Doktoranckie "Zaawansowane materiały dla nowoczesnych technologii i energetyki przyszłości"	01.01.2009-31.12.2015
501.220.2002 TERAZ FIZYKA	Andrzej Lenda	Teraz Fizyka. Nowe formy kształcenia bliżej pracodawcy	01.06.2010-31.10.2015
501.220.2003 Esmo MS000177	Mariusz Przybycień	Contract Between Surrey Satellite Technology Limited And AGH University of Science and Technology	26.11.2010-25.04.2014
502.220.2004 FIZYKA	Paweł Armatys	Fizyka - Twój wybór, Twoja przyszłość	01.06.2012-31.12.2015

PROGRAMY SPECJALNE

Nr umowy	Kierownik	Temat	Czas trwania
28.28.220.772 *DEC-2013/08/M/ST2/00320*	Władysław Dąbrowski	Eksperyment ATLAS: doświadczalna weryfikacja Modelu Standardowego i poszukiwania sygnałów Nowej Fizyki przy energiach LHC.	26.09.13 25.12.15
28.28.220.7029 665/N-CERN-ATLAS/2010/0	Danuta Kisielewska	Eksperyment ATLAS: rejestracja i analiza danych oraz utrzymanie i rozwój detektorów.	17.02.10 16.02.13
28.28.220.7032 680/N-CERN/2010/0	Bogdan Muryn	Eksperyment LHCb w CERN – obsługa detektora I uczestnictwo w programie badawczym.	02.04.10 01.04.13
28.28.220.7037 817/N-COST/2010/0	Mirosław Zimnoch	Ocena wielkości wymiany dwutlenku węgla miedzy atmosferą, ekosystemami lądowymi i wodnymi na obszarze zurbanizowanym Krakowa.	21.12.10 02.06.13
28.28.220.7042 DEC-2011/01/M/ST2/04126	Mariusz Przybycień	Badanie zderzeń relatywistycznych hadronów i jonów w eksperymencie STAR przy akceleratorze RHIC w BNL.	12.12.11 11.12.14
28.28.220.757	Mariusz Przybycień	Badanie oddziaływań elektronów z protonami w eksperymencie ZEUS na akceleratorze HERA w ośrodku DESY w Hamburgu.	03.04.13 26.03.15

PROGRAMY NAUKOWO-BADAWCZE OD INNYCH ZLECENIODAWCÓW

Nr umowy	Kierownik	Temat	Czas trwania
30.30.220.732	Paweł Jodłowski	Badania radioaktywności wyrobów węglowych i grafitowych dla SGL CARBON Polska S.A.	01.03.12 15.12.13
30.1.220.756	Sebastian Wroński	Analiza tomograficzna próbek PCB.	22.03.13 12.04.13

GRANT MINISTERIALNY JUVENTUS PLUS

Nr umowy	Kierownik	Temat	Czas trwania
68.68.220.773	Renata Szymańska	Rola lipidów prenylowych w niezgodności mieszańców.	11.04.12 10.04.14
68.68.220.734	Michał Nowak	Elektryczna kontrola i filtrowanie spinu w nanostrukturach półprzewodnikowych.	04.04.12 03.04.14
68.68.220.766	Paweł Wójcik	Symulacje komputerowe własności nadprzewodzących nanostruktur metalicznych.	25.06.13 24.06.15
68.68.220.773	Renata Szymańska	Rola lipidów prenylowych w niezgodności mieszańców.	11.04.12 10.04.14

PROJEKTY FUNDACJI NAUKI POLSKIEJ

Nr umowy	Kierownik	Temat	Czas trwania
72.72.220.8003	Bartłomiej Szafran	Kraków Interdisciplinary PhD-Project in Nanoscience and Advanced Nanostructures	01.10.08 30.09.13
72.220.8009	Józef Korecki	Atomic and molecular recel devising of functional nanostructures for magnetic and catalytic applications-AMON	01.03.09 28.02.13

Publications

Books and book chapters

Books published in Poland

1. B. J. SPISAK
„Własności transportowe i lokalizacja stanów jednoelektronowych w układach o zaburzonej symetrii translacyjnej", Wyd. Libron Kraków 2013 – monografia habilitacyjna

2. A. HORZELA, J. ADAMOWSKI, R. TOKARZ-SOBIERAJ. EDITORS: M. PERZANOWSKI, J. PAWŁOWSKI, M. CHROBAK, J. MOROŃ
Proceedings of the ISD Workshops. Wydawca: Faculty of Physics and Applied Computer Science, AGH University of Science and Technology, Kraków, 2013

3. ANDRZEJ ZIĘBA
Analiza danych w naukach ścisłych i technice, PWN, Warszawa, 2013
(ISBN: 978-83-01-17303-6).

Book chapters published abroad

4. S. STANKOV, T. ŚLĘZAK, M. ZAJĄC, M. ŚLĘZAK, M. SLADECEK, R. RÖHLSBERGER, B. SEPIOL, G. VOGL, N. SPIRIDIS, J. ŁAŻEWSKI, K. PARLIŃSKI, J. KORECKI
In-Situ ^{57}Fe Mössbauer Spectroscopy with Synchrotron Radiation on Thin Films in "Mössbauer Spectroscopy. Applications in Chemistry, Biology, Industry, and Nanotechnology", Sharma, Virender K. / Klingelhofer, Gostar / Nishida, Tetsuaki (eds.), John Wiley & Sons 2013

5. SOHARAB H. S., K. SAEED, N. CHAKI
Performance Benchmarking of Different Binarization Techniques for Fingerprint-based Biometric Authentication. Springer, Advances in Intelligent and Soft Computing, CORES, 2013. p. 237-246.

6. M. SZCZERBOWSKA-BORUCHOWSKA
Classification/Diagnosis of Brain Tumors Using Discriminant Function Analysis M.A. Hayat (ed.), Tumors of the Central Nervous System, Volume 12, Molecular Mechanisms, Children's Cancer, Treatments, and Radiosurgery DOI 10.1007/978-94-007-7217-5_1, © Springer Science+Business Media Dordrecht 2014 pp 3-18

7. D. CVETKOVIC, L. FIEDOR, J. FIEDOR, A. WISNIEWSKA-BECKER, D. MARKOVIC
Molecular Base for Carotenoids Antioxidant Activity in Model and Biological Systems: The Health-Related Effects. In "Carotenoids: Food Sources, Production and Health Benefits", Ed. M. Yamaguchi; Nova Science Publishers Inc., Hauppauge NY, 2013, pp. 93-126 ISBN: 978-1-62808-622-5

8. P. GKOGKOLOU, M. SARNA, T.A. LUNGER, M. BOEHM
KdPT: Novel protective role against impaired wound healing in diabetes?
Brain, Behavior, and Immunity 29 (15): S3, 2013.

Book chapters published in Poland

9. A. LENDA
Wybrane rozdziały matematycznych metod fizyki, Wydawnictwa AGH 2013

10. E. CHMIELOWIEC, A. ORZECHOWSKA, M. SARNA, M. ZĄBCZYK, A. UNDAS, K. BURDA
Influence of fibrinogen on the stability of erythrocytes.
Innovative technologies in biomedicine: the first international conference, październik 15-16 2013, Kraków, Abs.str.50.

11. PAWEŁ JEDYNAK, RENATA SZYMAŃSKA
Smakołyki z laboratorium.
Wiedza i Życie 11 (2013), 76-77.

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Artykuły w czasopismach z Listy Filadelfijskiej

1. J.HABERKO, A.BERNASIK, W.ŁUŻNY, M.HASIK, J.RACZKOWSKA, J.RYSZ, A.BUDKOWSKI
Humidity and Wetting Effects in Spin-Cast Blends of Insulating Polymers and Conducting Polyaniline Doped with DBSA
Journal of Applied Polymer Science, 127 (2013) 2354–2361
IF: 1.395, MNiSW: 25

2. I.V.ALENKINA, M.I.OSHTRAKH, YU.V.KLEPOVA, S.M.DUBIEL, N.V.SADOVNIKOV, V.A.SEMIONKIN
Comparative study of the iron cores in human liver ferritin, its pharmaceutical models and ferritin in chicken liver and spleen tissues using Mössbauer spectroscopy with a high velocity resolution
Spectrochimica Acta Part A, 100 (2013) 88–93
IF: 2.098, MNiSW: 25

3. S.M.DUBIEL, J.CIEŚLAK, H.REUTHER
Effect of He^+ irradiation on Fe–Cr alloys: Mössbauer-effect study
Journal of Nuclear Materials, 434 (2013) 235–239
IF: 1.211, MNiSW: 30

4. J.CIEŚLAK, S.M.DUBIEL
The Debye temperature of σ-phase Fe-Mo compounds as determined with Mössbauer spectroscopy
Intermetallics, 34 (2013) 159-161
IF: 1.857, MNiSW: 35

5. R.CAPUTO, A.KUPCZAK, W.SIKORA, A.TEKIN
Ab initio crystal structure prediction by combining symmetry analysis representations and total energy calculations. An insight into the structure of Mg(BH4)2†
Physical Chemistry Chemical Physics, 15 (2013) 1471-1480
IF: 3.931, MNiSW: 40

6. A.SZPAK, G.KANIA, T.SKÓRKA, W.TOKARZ, SZ.ZAPOTOCZNY, M.NOWAKOWSKA
Stable aqueous dispersion of superparamagnetic iron oxide nanoparticles protected by charged chitosan derivatives
Journal of Nanoparticle Research, 15 (2013) 1372:1-11
IF: 2.175, MNiSW: 30

7. S.M.DUBIEL, J.CIEŚLAK, M.REISSNER
Effect of magnetism on the lattice dynamics in the σ-phase FeCr alloys
EPL- Europhysics Leters, 101 (2013) 16008:1-6
IF: 2.172, MNiSW: 35

8. J.HABERKO, F.SCHEFFOLD
Fabrication of mesoscale polymeric templates for three- dimensional disordered photonic materials
Optics Express, 21/1 (2013) 1057:1-9
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Thermodynamic Properties of $RZnSn_2$(R = Y, Er, Lu) Compounds with $HfCuSi_2$ Structure Type
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2. A.BRITWUM, T.KOŁODZIEJ, W.TOKARZ, J.PRZEWOŹNIK, CZ.KAPUSTA, Z.KĄKOL, A.KOZŁOWSKI, Z.TARNAWSKI, J.M.HONIG
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3. R.ZACH, J.TOBOŁA, W,CHAJEC, D.FRUCHART, F.ONO
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6. S.SUGIHARTO, R.KURNIADI, Z.ABIDIN, Z.STĘGOWSKI, L.FURMAN
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15. M.JEDRYCHOWSKI, J.TARASIUK, B.BACROIX, S.WROŃSKI
An alternative method of grain boundary characterization
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16. M.JĘDRYCHOWSKI, J.TARASIUK, B.BACROIX
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17. D. CVETKOVIC, L.FIEDOR, J.FIEDOR, A.WIŚNIEWSKA-BECKER, D.MARKOVIC
Molecular Base for Carotenids Antioxidant Activity on Model and Biological Systems: The Health-Related Effects
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19. K.MISZTAL, J.TABOR
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21. M.DULIŃSKI, L.RAJCHEL, M.CZOP, J.MOTYKA, J.RAJCHEL
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Biuletyn Państwowego Instytutu Geologicznego:
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22. S.WITCZAK, J.KANIA, G.MALINA, A.POSTAWA, A.ŻUREK, M.DULIŃSKI, K.RÓŻAŃSKI, P.WACHNIEW, G.NIKIEL
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Hydrogeologia, 456/2 (2013) 633-644
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23. J.WOLNY, B.KOZAKOWSKI, P.KUCZERA, Ł.PYTLIK, R.STRZAŁKA
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24. B.KOZAKOWSKI, J.WOLNY
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25. R.STRZAŁKA, J.WOLNY, P.KUCZERA
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26. J.RYSZ, M.JOSIEK, MATEUSZ M.MARZEC, E.MOONS
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Journal of Polymer Science, Part B: Polimer Physics, 51 (2013) 1419–1426
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27. M.ROGOWSKI, K.SAEED, M.RYBNIK, M.TABEDZKI, M.ADAMSKI
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28. S.H.SHAIKH, M.TABEDZKI, N.CHAKI, K.SAEED
Bengali Printed Character Recognition - A New Approach
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29. A.UNIWERSAŁ, M.WRÓBEL, S.WROŃSKI, J.BONARSKI, A.TCHÓRZ, B.KANIA
Porównanie wybranych metod badania porowatości odlewów ciśnieniowych ze stopu magnezu AZ91.
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30. A.SKWAREK, B.SYNKIEWICZ, K.WITEK, S.WROŃSKI
Application of vapor phase soldering (VPS) for joints reliability improvement
IJMO:International Journal of Modeling and Optimization, 3/5 (2013) 386-389
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Patents
Patenty

1. K. MATUSIAK, M. WASILEWSKA-RADWAŃSKA, A. STĘPIEŃ
Patent nr P.385789 „Dynamiczny fantom serca” (Dynamic phantom of heart)

2. K. MATUSIAK, A. JUNG
Zgłoszenie patentowe nr. PL396779A1: „Fantom dozymetryczny” (dosimetric phantom)

Conferences presentations and seminars

Invited lectures

1. M.MARCISZKO, A.BACZMAŃSKI, K.WIERZBANOWSKI, J.-P.CHOPART, A.LODINI, A. BENMAROUANAE, N.ZAZI, C.BRAHAM, W. SEILER
   Stress measurements in polished Al–Mg alloy and CrN coating using multireflection grazing incidence method, THERMEC 2013: International Conference on Processing & Manufacturing of Advanced Materials, Book of abstracts, p. 376, Las Vegas, USA, 2013

2. A. BACZMAŃSKI, E. GADALIŃSKA, C. BRAHAM, S. WROŃSKI, L. LE JONCOUR, B. PANICAUD, M. FRANCOIS AND V. KLOSEK
   Study of micromechanical behaviour of two phase polycrystalline materials using diffraction and self consistent model, THERMEC 2013: International Conference on Processing & Manufacturing of Advanced Materials, Book of abstracts, p. 94, Las Vegas, USA, 2013

3. J. TOBOLA, K. KUTORASINSKI, S. KAPRZYK, J. CIESLAK
   Calculating electronic structure of complex disordered alloys to study their magnetic and transport behaviours, 12th International Conference on Quasicrystals ICQ12, Krakow, Poland, 2013

4. J .TOBOLA, K. KUTORASIŃSKI, S. KAPRZYK
   Theoretical study of Heusler systems with physical properties governed by electronic structure features for thermoelectric applications, TEP-CH 2013: Synthesis and Function of Thermoelectric Materials, Zurich, Switzerland, 2013

5. J.TOBOLA, K. KUTORASIŃSKI, S. KAPRZYK, J. MOLENDA
   Studying thermoelectric conversion in complex solids from first principles calculations, 4th Polish Forum: SMART ENERGY conversion & storage, Krynica, Poland, 2013

6. B. WIENDLOCHA, M. STERNIK
   Effect of tetragonal distortion on the electronic structure, phonons and superconductivity in Mo3Sb7, XVI National Conference on Superconductivity, Zakopane, Poland, 2013

7. J. TOBOLA, S. KAPRZYK, K. KUTORASINSKI
   Calculation of transport properties in disordered thermoelectrics using complex energy Fermi surface and Boltzmann approach, MRS Fall Meeting, Symposium Thermoelectric Materials: From Basic Science to Applications, Boston, USA, 2013

8. D. DJURADO, M. BEE, M. ŚNIECHOWSKI, S. MARTINS, A. PROŃ, P. RANNOU, J.M. ZANOTTI, S. HOWELLS, J. COMBET, W. ŁUŻNY
   Local dynamics in conducting polymers measured by quasi-elastic incoherent neutron scattering
   IX International Conference on X-Ray Investigations of Polymer Structure (XIPS2013), Zakopane, 2013

9. K. SAEED
New Problems and Solutions in Biometrics. ICRTST– International Conference on Recent Trends In Science & Technology India, Kolaghat 27-29 December, 2013

10. K. SAEED
Biometrics and Society - Impact of Kansei Engineering on Biometrics.
ICBAKE - International Conference on Biometrics and Kansei Engineering, Japan, Tokyo 5-7 July, 2013

11. J. SPAŁEK
"Critical Electronic Properties of Correlated Metals" International Conference "Energy for Future", Krynica, 02-06/06/2013

12. K. KUŁAKOWSKI
Indeterminizm obliczeniowy w złożonych układach społecznych
42 Zjazd Fizyków Polskich, Poznań, 8-13.09.2013

13. J. MALINOWSKI, M. J. KRAWCZYK, P. GAWROŃSKI, K. KUŁAKOWSKI, J. W. KANTELHARDT
Collective map making, Summer Solstice, International Conference on Discrete Models of Complex Systems, Warszawa, 27-29 czerwca 2013

14. J. ADAMOWSKI, P. WÓJCIK, B.J. SPISAK, M. WOŁOSZYN
Spin-polarized current modifi-cation in gated semiconductor nanowires.
Energy Materials Nanotechnology Fall Meeting, Orlando, Florida, USA, 7-10 December 2013.

15. P. SZUMNIAK AND S. BEDNAREK
Electron and hole soliton effects in gated semiconductor nanowires for application in quantum computing, XXII International Materials Research Congress (IMRC) 2013, Cancun, Meksyk, 11-15 Sierpień 2013

16. J. SPAŁEK
50 years of Hubbard Model: From Magnetism to Unconventional Superconductivity and Back, XVI Krajowa Konferencja Nadprzewodnictwa, Zakopane, 7-12/10/2013

17. P. BOŻEK
Ridge Correlations in pp/pPb: hydro perspective. ZJet Quenching at RHIC vs LHC in Light of Recent dAu vs pPb Controls" , Brookhaven National Laboratory, USA, 15-17 March 2013.

18. P. BOŻEK
Hydrodynamic flow in p+p and p+Pb collisions. Particle Production in Proton-Proton Interactions and Beyond, Bad Liebenzell, Germany, March 29 - May 3 2013.

19. P. BOŻEK
Hydrodynamic models of particle production. Strangeness in Quark Matter 2013 Conference, Birmingham, UK, July 21-27 2013.

20. P. BOŻEK
Hydrodynamic flow in pA. 2nd Workshop on Initial Fluctuations and Final Correlations , 2013, Chengdu, China, August 11-14 2013.

21. P. BOŻEK
Hydro approach to pPb. International Conference on the Initial Stages in High-Energy Nuclear Collisions, Illa da Toxa, Spain, September 8-14 2013.

22. M. ZIMNOCH, A. JASEK, L. CHMURA, J.M. NECKI, K. ROZANSKI, M. KLISCH, W. WOŁKOWICZ
Application of Picarro G2101-i for mobile methane measurements in Silesia, Southern Poland, II Seminarium: "Mozliwości aplikacyjne Mobilnych Analizatorów Izotopowych wykorzystujacych technike CRDS", Warszawa 02 Października 2013.

23. P. JODŁOWSKI
Zagrożenie radiologiczne podczas normalnej pracy elektrowni jądrowej, XVI Konferencja Inspektorów Ochrony Radiologicznej, Warszawa,23-26.05.2013r.

24. K. RÓŻAŃSKI
Lectures at the International Training Course on the Use of Isotope Hydrology Tools in the Context of Water Resources Assessment:
1. Isotopes in surface water and its interaction with groundwater
2. Isotopes in groundwater – characterization and conceptualization of groundwater flow systems, International Atomic Energy Agency,
Vienna, Austria, 7-8 November 2013.

25. T. BOŁD FOR THE ATLAS COLLABORATION
The core trigger software framework of the ATLAS experiment. 20th International Conference on Computing in High Energy and Nuclear Physics (CHEP 2013), 14-18 October , 2013, Amsterdam, The Netherlands.

26. I. GRABOWSKA-BOŁD
Hard probes with ATLAS. XLVIII Rencotres de Moriond , QCD and High Energy Interactions , 9-16 March 2013, La Thuile, Italy.

27. A OBŁĄKOWSKA-MUCHA (LHCB, VELO)
The LHCb Vertex Locator – Performance and Radiation Damage. 13th Topical Seminar on Innovative Particle and Radiation Detectors (IPRD13), 7-10 October 2013, Siena, Italy.

28. T. SZUMLAK
SALT ASIC. VELO Upgrade Technology Review Workshop, 22-23 May.2013, Amsterdam, Netherlands.

29. T. SZUMLAK
SALT Digital Signal Processing. UT Conceptual Design Review 14-15 November 2013 Syracuse, Greece.

30. L. ADAMCZYK FOR THE STAR COLLABORATION
Recent Results in Polarized Proton-Proton Elastic Scattering at STAR. The 15th Conference on Elastic and Diffractive scattering, EDS Blois 2013, 9-13 September 2013, Saariselka, Finland.

31. L. ADAMCZYK FOR THE STAR COLLABORATION
Recent Results and Future Prospects in Central Exclusive Production at STAR. The 15th Conference on Elastic and Diffractive scattering, EDS Blois 2013, 9-13 September 2013 Saariselka, Finland.

32. M. IDZIK
Readout Electronics for Future Particle Physics Experiments. Invited lecture on All-Russian Methodology Workshop on Computer Aided Design of Integrated Circuits for physical instrumentation, 29 October 2013 NRNY "MEPHI", Moscow Russia.

33. M. IDZIK
Fundamental of ADC conversion. Invited lecture on International Workshop on DATA driven FEE for time and energy measurement with highly segmented detector, Torino Italy 25-27 November 2013.

34. M. IDZIK
Low Power ADC design. Invited lecture on International Workshop on DATA driven FEE for time and energy measurement with highly segmented detektor, Torino Italy 25-27 November 2013.

35. M. IDZIK
Deep sub-micron CMOS technologies in present and future particle physics experiments. Invited lecture on 3rd ISD Workshop 9-15 June 2013 Szczyrk, Poland

36. M. LANKOSZ, M. SZCZERBOWSKA-BORUCHOWSKA, A. WANDZILAK, M. CZYZYCKI, D. ADAMEK, E. RADWAŃSKA
Application of X-ray fluorescence and X-ray absorption microspectroscopies in biomedical research. TXRF2013 : The 15th International Conference on Total Reflection X-ray Fluorescence Analysis and Related Methods and The 49th Annual Conference on X-ray Chemical Analysis: September 23–27, 2013, Osaka, Japan: book of abstracts p. 206–207.

37. K. BURDA
Early stage of essential hypertension monitoring.
BIT's Annual International Congress of Cardiology 2013 (ICC-2013) 04-05.12.2013, Rome, Italy.

38. K.BURDA
Application of selected spectroscopic methods in studies of biological samples.
Trzecie Warsztaty Naukowe ISD, 9-15 czerwiec 2013, Szczyrk.

39. Ł. GONDEK
wykład zaproszony „In-situ neutron scatetring studies on Ti-based deuterides”, Helmholtz-Zentrum Berlin, 07.05.2013;

40. Ł. GONDEK
wykład zaproszony „Neutron techniques for hydrogen storage”, NMI3-II General Assembly, Berlin, 20.06.2013

41. J. KORECKI
„Pierwsza linia pomiarowa synchrotronu SOLARIS”, seminarium Instytutu Katalizy i Fizykochemii Powierzchni im. Jerzego Habera PAN, 20.03.2013, Kraków

42. J. KORECKI
„LEEM - mikroskopia elektronowa na niskoenergetycznych elektronach, czyli jak obrazować powierzchnie "na żywo" z rozdzielczością nanometrową”, seminarium Wydziału Fizyki i Informatyki Stosowanej AGH, 12.04.2013, Kraków

43. J. KORECKI
„Spektro-mikroskopia z użyciem miękkiego promieniowania X w SOLARIS", seminarium Wydziału Chemii UJ, 05.06.2013, Kraków

44. T. ŚLĘZAK
„Jądrowe rozpraszanie promieniowania synchrotronowego w badaniach magnetyzmu nanostruktur Fe", seminarium Wydziału Fizyki i Informatyki Stosowanej AGH, 20.09.2013, Kraków

45. M. PRZYBYLSKI
"Magnetic anisotropy, exchange bias effect and orthogonal spin configuration in FM/AFM bilayers", International Multidisciplinary Joint Meeting "Nano Science and Condensed Matter Physics 13-17.05.2013, Morelia, Michoacan, Mexico

46. M. PRZYBYLSKI
"Controlling magnetic anisotropy via interface exchange coupling"
International Conference on Nanoscale Magnetism (ICNM-2013) 2-6.09.2013, Istanbul, Turkey

47. M. PRZYBYLSKI
"Controlling magnetic anisotropy", Fifth Seeheim Conference on Magnetism (SCM2013) 29.09.-03.10.2013, Frankfurt, Germany

48. M. PRZYBYLSKI
„Controlling magnetic anisotropy via the density of states at the Fermi level"
XVI Krajowa Konferencja Nadprzewodnictwa, 8-12.10.2013, Zakopane, Poland

Contributed presentations

1. A. KUPCZAK
Symmetry relations between different structural representations of magnesium borohydride,Proceedingsof the ISD Workshops, s. 227, Kraków , 2013
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Measurements of atmospheric CO_2, CH_4 and CO mixing ratios at the mountain site Kasprowy Wierch, Southern Poland. ACCENT-Plus Symposium, Urbino, Italy, 17-20 September 2013.
POSTER

102. M. ZIMNOCH, Z. GORCZYCA, K. PIENIAZEK, A. JASEK, L.CHMURA, K. ROZANSKI
Application of Relaxed Eddy Accumulation (REA) method to estimate CO_2 and CH_4 surface fluxes in the city of Krakow, southern Poland, EGU General Assembly, Vienna , Austria, 7-12 April 2013.
POSTER

103. A. JASEK, M. ZIMNOCH, Z. GORCZYCA, K. ROZANSKI
Urban soil CO_2 emissions: case study from Krakow, southern Poland, EGU General Assembly, Vienna, Austria, 7-12 April 2013.
POSTER

104. A. JASEK, P. WACHNIEW, M. ZIMNOCH,
Riverine GHG emissions: one year of CO_2, $^{13}CO_2$ and CH_4 flux measurements on Vistula river in Krakow, southern Poland. EGU General Assembly, 7-12 April 2013.
POSTER

105. L. CHMURA, J. NĘCKI, M. ZIMNOCH
Antropogeniczny metan w przyziemnej warstwie atmosfery na terenie Górnośląskiego Okręgu Przemysłowego. Konferencja nt: wpływu młodych naukowców na osiągnięcia polskiej nauki, IV edycja, Gdańsk, 12 kwietnia 2013.
ORAL

106. Z. GORCZYCA, M. ZIMNOCH, A. JASEK, S. WEGLARCZYK, K. ROZANSKI
Static chamber system for parallel measurements of soil carbon isofluxes. COST-SIBAE 2013 Meeting: Challenges in the applications of stable isotopes across disciplines and scales, Wroclaw, Poland, 14-17 May 2013.
POSTER

107. M. ZIMNOCH, J. D. JELEN, T. KUC, J. NECKI, K. ROZANSKI
Diurnal Changes of Carbon Budget in the Urban Atmosphere of Krakow, Southern Poland. COST-SIBAE 2013 meeting „Challenges in the applications of stable isotopes across disciplines and scales", Wroclaw, Poland, 14-17 May 2013.
ORAL

108. A. JASEK, M. ZIMNOCH, P. WACHNIEW, K. ROZANSKI
Biogenic CO_2 emissions In Urban environment: A case study from Krakow, Southern Poland. COST-SIBAE 2013 meeting „Challenges in the applications of stable isotopes across disciplines and scales", Wroclaw, Poland, 14-17 May 2013.
POSTER

109. P. WACHNIEW, E. ŁOKAS P. BARTMIŃSKI , T. KAWIAK, J. ŚRODOŃ
Enhanced levels of fallout radionuclides in the proglacial environment.
IAHS IAPSO IASPEI Joint Assembly, Gothenburg, Sweden, 22-26 July 2013.
ORAL

110. E. ŁOKAS, P. WACHNIEW, J.W. MIETELSKI, M. KETTERER, K. KLESZCZ, M. MIECZNIK, S. MICHALSKA.
Sources and behaviour of fallout radionuclides in High Arctic peats. IAHS IAPSO IASPEI Joint Assembly, Gothenburg, Sweden, 22-26 July 2013.
ORAL

111. M. DULINSKI M., J. BARTYZEL, J. KANIA, P. WACHNIEW, I. ŚLIWKA, P. MOCHALSKI, K. ROZANSKI
Residence time distribution of young groundwater derived from tracer data and 3D flow and transport modeling. IAHS IAPSO IASPEI Joint Assembly, Gothenburg, Sweden, 22-26 July 2013.
ORAL

112. E. ŁOKAS, P. WACHNIEW, M. GĄSIOREK, P. BARTMIŃSKI
Behaviour of Anthropogenic Radionuclides in the Proglacial Environment. Goldschmidt Conference 2013, Florence, Italy, 25-30 August 2013.
POSTER

113. P. JODŁOWSKI, P. WACHNIEW , CH. NGUYEN DINH
Monte Carlo estimation of the self-absorption correction accuracy with the Cutshall transmission method in determinations of 210Pb by gamma-spectrometry. 19th International Conference on Radionuclide Metrology and its Applications ICRM 2013, Antwerp, Belgium,17-21 June 2013.
POSTER

114. M.GAŁKOWSKI, K. CIACIEK, J. NĘCKI
Strumienie N_2O z gleb poddanych silnej antropopresji na przykładzie Krakowa. Konferencja nt: Wpływ młodych naukowców na osiągnięcia polskiej nauki, IV edycja, Gdańsk, 12 kwietnia 2013.
POSTER

115. M. GAŁKOWSKI
Two decades of atmospheric composition measurements at KASLAB station (Kasprowy Wierch, Tatra Mountains). The First Interdyscyplinary Symposium on Biogeography of the Carpathians: Evolution of Biodiversity in a Spatiotemporal Context, 26-28 September 2013, Kraków, Poland
ORAL

116. M. GAŁKOWSKI, J.V. LAVRIC
Gradients of lower tropospheric methane concentrations at the Bialystok tall tower (north-eastern Poland). ACCENT-Plus Symposium, Urbino, Italy, 17-20 September 2013.
POSTER

117. J.M. NĘCKI, M. GAŁKOWSKI, L. CHMURA, D. ZIĘBA, J. BARTYZEL
Towards molecular hydrogen budgeting at regional scale in southern Poland. ACCENT-Plus Symposium, Urbino, Italy, 17-20 September 2013.
POSTER

118. M. GAŁKOWSKI, K. CIACIEK, J.M. NĘCKI
N_2O fluxes from urban soils under stron anthropopression: a case study from Kraków (Southern Poland). InGOS 1st General Project Meeting Workshop, Bremen, Germany, March 12-14th, 2013.
POSTER

119. M. DULIŃSKI, L. RAJCHEL, M. CZOP, J. MOTYKA, J. RAJCHEL
Badania izotopowe wód mineralnych rejonu Iwonicz-Rymanów. Współczesne Problemy Hydrogeologii, XVI Sympozjum, Jachranka, 16-18.10.2013.
ORAL

120. CH. NGUYEN DINH, M. KOPEĆ
Factors controlling occurrence of radium isotopes and their activity ratio in groundwaters. AIG Conference, Budapest, 22-27 September 2013.
ORAL

121. P. BOŻEK
Hydrodynamic flow in pPb. Seminar at Physics Department, Purdue University, September 20 2014, USA

122. T. BOŁD
Overview of the p-Pb run trigger.
Trigger General Meeting/ATLAS Week, 6.02.213, CERN.

123. OZKAN SAHIN AND TADEUSZ KOWALSKI
Gas gain and energy transfer rate measurements in Ar + CO2 mixtures. MPGD 2013 and 11-th RD51 Collaboration Meeting, 5-6 July 2013, Zaragoza, Spain.

124. OZKAN SAHIN AND TADEUSZ KOWALSKI
Recent gain calculation.
2-th RD51 Collaboration Meeting, 14-17 October 2013, CERN.

125. A. ZIELIŃSKA, W. DĄBROWSKI, T. FIUTOWSKI, B. MINDUR, P. WIĄCEK, P. WRÓBEL
X-ray Fluorescence Imaging System Based on a GEM Detector. 15th International Workshop on Radiation Imaging Detectors, 23-27 June, 2013, Paris, France.

126. M. FIRLEJ, T. FIUTOWSKI, M. IDZIK, J. MORON, K. SWIENTEK
Development of variable frequency, power Phase-Locked Loop (PLL) in 130nm CMOS technology. TWEPP 2013, Perugia Italy 23-27 September 2013.

127. J. MORON, M. FIRLEJ, T. FIUTOWSKI, M. IDZIK, K. SWIENTEK
Development of variable sampling rate, low power 10-bit SAR ADC in 130 nm IBM technology. TWEPP 2013, Perugia Italy 23-27 September 2013.

128. J. MORON ON BEHALF OF FCAL COLLABORATION
Readout electronics for LumiCal detector. Present status and new developments. ECFA Linear Collider Workshop 2013 27 - 31 May 2013, DESY in Hamburg, Germany.

129. SZ. KULIS ON BEHALF OF FCAL COLLABORATION
Power pulsing in LumiCal detector module first implementation and performance results. CLIC Workshop 2013, Geneva, 28 Jan - 1 Feb 2013.

130. K. SWIENTEK, M. FIRLEJ, T. FIUTOWSKI, M. IDZIK, SZ. KULIS, J. MORON
SAR ADC Architecture and status. International Workshop of FCAL Collaboration 29 April 2013, IFJ, Krakow Poland.

131. J. MORON, READOUT ELECTRONICS FOR LUMICAL DETECTOR
Present status and new developments. International Workshop of FCAL Collaboration 7 - 8 October 2013, DESY in Zeuthen, Germany.

132. M. IDZIK FOR FCAL COLLABORATION
R&D for the FCAL. ILD meeting 2013 in Cracow,
24-26 September 2013 Cracow Poland.

133. M. IDZIK FOR FCAL COLLABORATION
FCAL: Today and Future from detector perspective. CLIC Detector and Physics Collaboration meeting 2013, 1-2 October 2013 CERN.

134. K. SWIENTEK, M. FIRLEJ, T. FIUTOWSKI, M. IDZIK, J. MORON, T. SZUMLAK
SALT - new silicon strip readout chip for the LHCb Upgrade. TWEPP 2013, Perugia Italy 23-27 September 2013

135. D. PRZYBOROWSKI, M. IDZIK, T. FIUTOWSKI, P. SALABURA, P. STRZEMPEK, J. TOKARZ
Development of Dedicated Front--end Electronics for Straw Tube Tracker in PANDA Experiment. TWEPP 2013, Perugia Italy 23-27 September 2013.

136. P. KAPUSTA, I. AHMED, S. GLAB, M. IDZIK, M. TURALA
Prototype pixel detector in the SOI technology.
TWEPP 2013, Perugia Italy 23-27 September 2013.

137. M. IDZIK
SOI and related activities in Kraków.
SOI Collaboration Meeting 6-7 May 2013 Kraków, Poland.

138. I. GRABOWSKA-BOŁD
W Boson production in Pb+Pb and P+P collisions at ATLAS.
Seminarium IFJ PAN, 14.06.2013, Kraków.

139. I. GRABOWSKA-BOŁD
$W \rightarrow e\nu$ boson production in lead-lead data at $\sqrt{s_{NN}}$ = 2.76 TeV. Seminarium ATLAS IFJ PAN, 22.11.2013, Kraków.

140. I. GRABOWSKA-BOŁD
Highlights of Moriond QCD 2013.
Środowiskowe Seminarium Fizyki Wysokich Energii 12.04.2013, Kraków.

141. T. BOŁD
Pomiar wypływu metodą przypadek-po-przypadku w zderzeniach ołow-ołów w eksperymencie ATLAS. Środowiskowe Seminarium Fizyki Wysokich Energii 6.12.2013, Kraków.

142. T. BOŁD
Eksperyment Fizyki Wysokich Energii – ATLAS.
Wykład na Uniwersytecie Otwartym (UO) AGH 7.12.2013.

143. M. GRZELAK, B.OSTACHOWICZ, A. WANDZILAK, D. ADAMEK, E. RADWAŃSKA, M. LANKOSZ
Application of the TXRF method for the elemental analysis of brain tumors with differential grade of malignancy.
TXRF2013 : The 15th International Conference on Total Reflection X-ray Fluorescence Analysis and Related Methods and The 49th Annual Conference on X-ray Chemical Analysis : September 23–27, 2013, Osaka, Japan: book of abstracts p.27–28.
POSTER

144. M. CZYZYCKI, P. WROBEL, M. LANKOSZ
The Equation for Confocal X-Ray Fluorescence Experiment in Tilted Geometry.
22nd International Congress on X-ray Optics and Microanalysis, 2-6 September 2013, Hamburg, Germany.
POSTER

145. W. H. SCHROEDER, B. DE SAMBER, M. ROEB, E. VERGUCHT, P. ALRAUM, P. BHARGAVA, U. BOESENBERG, M. BRINKER, T. CLAUSSEN, G. FALKENBERG, J. PATOMMEL, C. SCHROER, B. VEKEMANS, M. CZYZYCKI, L. VINCZE, G. WELLENREUTHER
Development of a cryogenic sample environment for the analysis of biological tissue.
22nd International Congress on X-ray Optics and Microanalysis, 2-6 September 2013, Hamburg, Germany.
POSTER

146. A.D. SURÓWKA, D. ADAMEK, M. SZCZERBOWSKA-BORUCHOWSKA.
Evaluation of variability of biomolecular components in subtantia nigra tissue of human senile brains – by means of FTIR Microspectroscopy.
Seminar on Vibrational biospectroscopy and imaging : modern techniques of raman and IR imaging with chemometric analysis: 19–21 June 2013, Krakow.
POSTER

147. A.D.SURÓWKA, D.ADAMEK, M. SZCZERBOWSKA-BORUCHOWSKA
An utility of FTIRM technique towards the analysis of age-related changes occurring within subtantia nigra tissue".
Synchrotron Radiation User Meeting: 4-5 September, Diamond Light Source, Didcot, UK.
POSTER

148. M. SZCZERBOWSKA-BORUCHOWSKA, A. KRYGOWSKA-WAJS, A. ZIOMBER, P. THOR, I. ZIZAK, P. WROBEL
Chronic impairment of the vagus nerve function leads to changes in elemental composition of dopamine related brain structures in rats.
Joint BER II and BESSY II User Meeting: 4-6 December 2013, Berlin.
POSTER

149. L. SAMEK
XRF analysis and source identification and apportionment of PM2.5 fraction collected in Krakow, Poland.
Regional Workshop on interpretation of data from atmospheric Particulate matter (APM) transboundary movements and review of project achievements, IAEA technical Cooperation Project RER/1/008, 11-15 November, 2013.
ORAL

150. J.DUDALA, M. BIAŁAS, M. SZCZERBOWSKA-BORUCHOWSKA, M. BEREZA-BUZIAK, A. BUDZYŃSKI, A.HUBALEWSKA-DYDEJCZYK, M. KOŁODZIEJ, M.LANKOSZ
Application of SR-FTIR microspectroscopy for the preliminary biochemical study of the adrenal gland tumors.
Seminar on Vibrational Biospectroscopy and Imaging, Modern techniques of Raman and IR imaging with chemometric analysis, czerwiec 19-21, 2013 Kraków,Poland.
POSTER

151. M. LANKOSZ, M., SZCZERBOWSKA-BORUCHOWSKA, A. WANDZILAK., M.CZYZYCKI, D. ADAMEK., E. RADWAŃSKA
DEVELOPING TECHNIQUES FOR DETERMINING THE SPATIAL DISTRIBUTION, SPECIATION AND CHEMICAL ENVIRONMENT OF METALLIC ELEMENTS IN BRAIN TISSUES AFFECTED BY NEUROLOGICAL DISCORDERS.
Abstracts and proceedings of the 12th international symposium on Metal ions in biology and medicine : Punta del Este, Uruguay, May 11–13 March, 2013.
ORAL

152. P.WRÓBEL, M.CZYŻYCKI , D.WĘGRZYNEK, M.LANKOSZ
Direct deconvolution procedure for the quantification of multi-layer samples by confocal micro-XRF spectroscopy.
22nd International Congress on X-Ray Optics and Microanalysis (ICXOM22): 2–6 September 2013 Hamburg, Germany.
POSTER

153. M.KACZMARSKA, I. HABINA, K.NIEMIEC, M.FORNAL, W.POHORECKI, K.MATLAK, J. KORECKI, T. GRODZICKI, K. BURDA
Influence of neutron radiation on the stability of erythrocyte membrane and oxyhemoglobin formation.
01-06.09.2013 International Conference on the Applications of the Mössbauer Effect, ICAME-2013, Opatija, Chorwacja.
POSTER

154. K,BURDA, M.KACZMARSKA, M.FORNAL, F.MESSERLI, J. KORECKI, AND T. GRODZICKI
Early detection of essential hypertension by Moessbauer spectroscopy.
01-06.09.2013 International Conference on the Applications of the Mössbauer Effect, ICAME-2013, Opatija, Chorwacja.
ORAL

155. J. FIEDOR, R. HAESSNER, H. SCHEER, L. FIEDOR, K. BURDA
Application of 2D-NMR spectroscopy for assignment of ROS-oxygenated biomolecules.
Innovative Technologies in Biomedicine, Kraków, 15-16.10.2013.
POSTER

156. A. JAMROZIK, J. PRZEWOŹNIK, M. MAZURKIEWICZ, A. MAŁOLEPSZY, L. STOBIŃSKI, K. MATLAK, J. KORECKI, CZ. KAPUSTA, M. SITARZ, K. BURDA
Mössbauer Study of Functionalized Multiwall Carbon Nanotubes Ground in Agate and Steel Mill.
01-06.09.2013 International Conference on the Applications of the Mössbauer Effect, ICAME-2013, Opatija, Chorwacja.
POSTER

157. A. JAMROZIK, M. MAZURKIEWICZ, A. MAŁOLEPSZY, L. STOBIŃSKI, K. MATLAK, J. KORECKI, M. SITARZ, K. BURDA
Characteristics of Non – functionalized and Functionalized Multi - Wall Carbon Nanotubes.
XIIth International Conference on Molecular Spectroscopy-From Molecules to Nano- and Biomaterials, w dniach 8-12 sierpnia 2013 w Białce Tatrzańskiej.
POSTER

158. E. CHMIELOWIEC, A. ORZECHOWSKA, M. SARNA, M. ZĄBCZYK, A. UNDAS, K. BURDA
Influence of fibrinogen on the stability of erythrocytes.
Innovative technologies in biomedicine: the first international conference, październik 15-16 2013, Kraków.
POSTER

159. A.HAŁAS, V. DERRIEN, A.I.CHUMAKOV, P. SEBBAN, T.ŚLĘZAK, K. MATLAK, J. KORECKI, AND K. BURDA
Point mutations affect flexibility of protein systems and action of their prostetic groups. Society of Industrial Microbiology and Biotechnology Annual Meeting, 11-15 sierpień 2013, San Diego, Kalifornia, USA.
POSTER

160. A.HAŁAS, V. DERRIEN, A.I.CHUMAKOV, P. SEBBAN, T.ŚLĘZAK, K. MATLAK, J. KORECKI, AND K. BURDA
Chemical proprieties of the iron-quinone complex in mutated reaction centers of Rb. sphaeroides. International Conference on the Applications of the Mossbauer Effect, 1-6 wrzesień 2013, Opatija, Chorwacja.
POSTER

161. A. JUNG, W. KOMENDA
Humidity influence on thermoluminescent detectors dose response. The International Conference On Medical Physics, Brighton, W. Brytania, 1-4.09. 2013.
ORAL

162. Z. MATUSZAK
Siumlation of Fluorescence Light Emission during Phtodynamic Therapy of Malignant Pigmented Tumors. The 1st International Conference Innovative Technologies in Biomedicine, Kraków,15-16.10.2013
POSTER

163. Z. MATUSZAK
Fractional Bloch's Eqution Approach to Magnetic Relaxation. IX International Workshop on EPR(ESR) in Biology and Medicine, Kraków, 7-10.10.2013.
ORAL

164. B. PRONIEWSKI, H. FIGIEL
Thermal and Electromagnetic Modelling of a Superconducting RF Coil for Magnetic Resonance Imaging. Biomedical Engineering Society Annual Meeting 2013, Seattle, USA, 25-28.09.2013.
POSTER

165. K. KŁODOWSKI, K. NOWICKA, E. SOŁTYSIAK, B. PRONIEWSKI, M. BŁAŻEWICZ, H. FIGIEL, K. TUREK
Investigation of bio-compability of the polycaprolactone bone implants through the low field MRI. AMPERE NMR School, Zakopane, 23–29.06.2013.
POSTER

166. K. KŁODOWSKI, K. NOWICKA, M. BŁAŻEWICZ, H. FIGIEL
Perspectives of MRI diagnostic of three different polymer bone implants.
The 1st International Conference Innovative Technologies in Biomedicine, Kraków,15-16.10.2013
POSTER

167. K. KŁODOWSKI, K.NOWICKA, M. BŁAŻEWICZ, H. FIGIEL
Magnetic polymers designed for bone implants under MRI investigation.
Advanced Bioimaging Technologies Conference, Kraków, 24-26.09.2013.
POSTER

168. M. ŚWIĘTEK , W. TOKARZ , H. FIGIEL , J. TARASIUK, S. WROŃSKI, M. BŁAŻEWICZ
Magnetic polymer sponge for medical applications, Innovative technologies in biomedicine. The 1st International Conference Innovative Technologies in Biomedicine, Kraków,15-16.10.2013
POSTER

169. M. JABŁOŃSKA, U. TYRANKIEWICZ, H. FIGIEL, T. SKÓRKA
LV performance parameterization using spline smoothing and PLR modeling in mice with heart failure. Advanced Bioimaging Technologies Conference, Kraków, 24-26.09.2013.
POSTER

170. K. TUREK, B. TOMANEK
What is new in technology of desktop MRI systems? Advanced Bioimaging Technologies Conference, Kraków, 24-27.09.2013.
ORAL

171. J. CHWIEJ, J. KUTORASINSKA, K. JANECZKO, K. APPEL, R. SIMON, P. DUMAS, C. SANDT, Z. SETKOWICZ
Modern spectroscopic methods in the analysis of the biochemical basis of neurodegenerative changes in the epileptic rat brain. 4th London-Innsbruck Colloquium on Status Epilepticus and Acute Seizures, Salzburg, Austria: 4-6.04.2013.
POSTER

172. J. KUTORASINSKA, Z. SETKOWICZ, K. JANECZKO, J. FREDERIC, C. SANDT, P. DUMAS,K. GZIELO-JUREK, J. CHWIEJ
Biochemical changes of hippocampal formation occurring in the kindling rat model of epilepsy with repetitive electrical stimulation – SRFTIR microspectroscopy study. 12th International Conference on Molecular Spectroscopy, From Molecules to Nano- and Biomaterials, Kraków-Białka Tatrzańska, 8-12.09.2013.
ORAL

173. J. CHWIEJ, H. GABRYŚ, J. KUTORASINSKA, K. JANECZKO, K. GZIELO-JUREK, K. MATUSIAK, K. APPEL, P. DUMAS, C. SANDT, J. FREDERIC, Z. SETKOWICZ
Synchrotron X-ray and IR microbeam imaging in the research under epilepsy pathogenesis in electrical kindling rat model. Seminar on Vibrational Biospectroscopy and Imaging, Kraków, 19-21.06.2013.
ORAL

174. S. M. DUBIEL, J. CIEŚLAK, H. REUTHER
On the effect of He+ irradiation on the presurface zone od Fe-Cr alloys.
Workshop on particle-surface interactions: from surface analysis to materials processing (PASI 2013), Luxembourg, 3-5 June, 2013.
ORAL

175. S. M. DUBIEL, J. CIEŚLAK
Effect of quenching conditions on SRO in Fe-Cr alloys.
MAT-IREMEV Monitoring Meeting: Radiation effects Modelling and Experimental Validation, Bucharest, 26-28 June 2013.
ORAL

176. J. CIESLAK, S. M. DUBIEL
Effect of strain on alpha-sigma phase transformation in Fe-Cr alloys.
MAT-IREMEV Monitoring Meeting: Radiation effects Modelling and Experimental Validation, Bucharest, 26-28 June 2013.
ORAL

177. J. CIEŚLAK, S. M. DUBIEL
Effect of plastic deformation on the sigma-phase formation in Fe54Cr46.
International Conference on the applications of the Mössbauer effect (ICAME 2013), Opatija, 1-6 September 2013.
ORAL

178. S. M. DUBIEL, J. CIEŚLAK, M. REISSNER
Magnetic origin of lattice dynamics anomalies in sigma-FeCr alloys.
International Conference on the applications of the Mössbauer effect (ICAME 2013), Opatija, 1-6 September 2013.
ORAL

179. S. M. DUBIEL, J. ŻUKROWSKI
Miscibility gap in Fe-Cr alloy system.
International Conference on the applications of the Mössbauer effect (ICAME 2013), Opatija, 1-6 September 2013.
POSTER

180. B. F. O. COSTA, J. CIEŚLAK, S. M. DUBIEL
Kinetics of the sigma-phase formation in equiatomic Fe-V alloys.
International Conference on the applications of the Mössbauer effect (ICAME 2013), Opatija, 1-6 September 2013.
POSTER

181. J. CIEŚLAK, S. M. DUBIEL, J. PRZEWOŹNIK, M. REISSNER
Investigation of Frank-Kasper phases in Fe-Mo system.
International Conference on the applications of the Mössbauer effect (ICAME 2013), Opatija, 1-6 September 2013.
POSTER

182. M. I. OSHTRAKH, E. G. NOVIKOV, S. M. DUBIEL, V. A. SEMIONKIN
Comparative study of Ascofer and ferrous gluconate using Mössbauer spectroscopy with a high velocity resolution.
International Conference on the applications of the Mössbauer effect (ICAME 2013), Opatija, 1-6 September 2013.
POSTER

183. J. CIEŚLAK, S. M. DUBIEL, I. V. ALENKINA, M. I. OSHTRAKH, V. A. SEMIONKIN
Evaluation of Debye temperaturę for nanosized iron core in Ferrum Lek using Mössbauer spectroscopy with a high velocity resolution.
International Conference on the applications of the Mössbauer effect (ICAME 2013), Opatija, 1-6 September 2013.
POSTER

184. S. M. DUBIEL, J. CIEŚLAK, H. REUTHER
Effect of 25 keV He+ irradiation on magnetism of Fe-Cr alloys.
Fifth Seehem Conference on Magnetism, Frankfurt a/M, 29 September – 3 October 2013.
ORAL

185. T. CICHOREK,L.BOCHENEK, K.ROGACKI, A.KOŁODZIEJCZYK
Coexistance of superconductivity and ferromagnetism In Y9Co7: a renewed experimental study
XVI Krajowa Konferencja Nadprzewodnictwa, Zakopane, 7-12.10. 2013.
ORAL

186. M.CHROBAK, W.M WOCH, G.SZWACHTA, R.ZALECKI, A.KOŁODZIEJCZYK
Thermal fluctuations in YBCO thin film on MgO substrate
POSTER

187. R. ZALECKI, W.M. WOCH, M. CHROBAK, A. KOŁODZIEJCZYK, POSTER
A.c. susceptibility of YBCO 1:2:3 films on silver substrates

188. R. ZALECKI , W.M. WOCH, A. KOŁODZIEJCZYK, W. T. KOENIG, G. GRITZNER
Penetration Depth of bulk Tl2Ba2Ca2Cu3Oyand Tl0.58Pb0.4Sr1.6Ba0.4Ca2Cu3Oy Superconductors
POSTER

189. R. ZALECKI, W.M. WOCH, M. CHROBAK, A. KOŁODZIEJCZYK
a.c. susceptibility of YBCO 1:2:3 films on silver substrate
POSTER

190. A. DZIAŁO, A. PAJA
Size Effects in the Resistivity of Ultra-thin Metallic Layer, XLVIII Zakopane School of Physics, 20th to 25th May, 2013.

191. A. DZIAŁO
Resistivity of ultra-thin metallic films, Trzecie Warsztaty Naukowe ISD9-15 czerwca 2013, Szczyrk.

192. W.M WOCH, M.CHROBAK, R.ZALECKI, A.KOŁODZIEJCZYK,
Study of resistive superconducting transition of bulk (Bi0.6Pb0.4)2Sr2Ca2Cu3Ox
International Conference CSAMAG, Koszyce, 8-12 September 2013
POSTER

193. E. MŁYŃCZAK, A. KOZIOŁ- RACHWAŁ, B. MATLAK, J. GURGUL, T. ŚLĘZAK, N. SPIRIDIS AND J. KORECKI
"Fe/CoO(001) and Fe/CoO(111) bilayers: crystalline structure, stoichiometry and exchange bias", Interdisciplinary Surface Science Conference (ISSC-19), 25 – 28 March 2013, Nottingham, United Kingdom

194. M. SZCZEPANIK-CIBA, R. SOCHA, N. SPIRIDIS, B. FIGARSKA, E. MADEJ AND J. KORECKI
„Synthesis and properties of epitaxial mixed Fe-Mn oxides on MgO(100)", Interdisciplinary Surface Science Conference (ISSC-19), 25 – 28 March 2013, Nottingham, United Kingdom

195. M. ŚLĘZAK, T. GIELA, D. WILGOCKA-ŚLĘZAK, N. SPIRIDIS, T. ŚLĘZAK, M. ZAJĄC, M. STANKIEWICZ, N. PILET, J. RAABE, C. QUITMANN, J. KORECKI
"Prospects of X-ray Photoemission Electron Microscopy at the fisrt beamline of Polish synchrotron SOLARIS", 8th International Conference Solid State Surfaces and Interfaces, 25-28 November 2013, Smolenice, Slovak Republic

196. E. MŁYŃCZAK, J. GURGUL, N. SPIRIDIS, J. KORECKI
"Chemical structure of the metal- oxide interfaces" 6th International Workshop on Surface Physics IWSP 2013 Functional Materials, 1-6 September 2013, Niemcza, Poland

197. K. FREINDL, M. ZAJĄC, N. SPIRIDIS, T. GIELA, M. ŚLĘZAK, T. ŚLĘZAK AND J. KORECKI
"Oxygen adsorption on Fe(110) revisited", 8th International Conference Solid State Surfaces and Interfaces, 25-28 November 2013, Smolenice, Slovak Republic

198. K.A. BALIN, A. NOWAK, M.WOJTYNIAK, J. SZADE, J. KORECKI, M. SLEZAK, D.WILGOCKA-SLEZAK, T. GIELA, C. QUITMANN, J. RAABE AND Z. CELINSKI
"Magnetic properties of Eu-Fe thin films", 12th Joint MMM Intermag Conference, 14-18 January 2013, Chicago, Illinois, USA

199. M. ZAJĄC, A. BIANCO, C.J. BOCCHETTA, E. BUSETTO, J. KORECKI, K. KUBAL, F. MELKA, M. OSTOJA-GAJEWSKI, M. SIKORA, M.J. STANKIEWICZ, Ł. WALCZAK, A.I. WAWRZYNIAK, K. WAWRZYNIAK, Ł. ŻYTNIAK
"First beamline at Solaris", X Krajowe Sympozjum Użytkowników Promieniowania Synchrotronowego, 9-11 września 2013, Stalowa Wola

200. R.P. SOCHA, M. SZCZEPANIK-CIBA, B. STRZELCZYK, N. SPIRIDIS, J. WOJAS, J. KORECKI
"Utlenianie CO na odwrotnym modelowym katalizatorze MnO/Pt(111)", XLV Ogólnopolskie Kolokwium Katalityczne, 13-15.03.2013, Kraków, p: 28 [ISBN 978-83-60514-18-4]

201. M. SZCZEPANIK-CIBA, R.P. SOCHA, B. FIGARSKA, E. MADEJ, N. SPIRIDIS, J. KORECKI
"Synteza, charakterystyka i właściwości katalityczne mieszanych tlenków manganu i żelaza na MgO(001)", XLV Ogólnopolskie Kolokwium Katalityczne, 13-15.03.2013, Kraków, p: 126 [ISBN 978-83-60514-18-4]

202. K. GĄSKA, A. RYBAK, R. SEKUŁA, F. TOCHE, V. SALLES, CZ. KAPUSTA
"Functional epoxy composites based on core-shell fillers.", E-MRS Fall Meeting 2013, 16-20 September 2013, Warszawa.
ORAL

203. K. GĄSKA, A. RYBAK, G. KMITA, R. SEKUŁA, CZ. KAPUSTA
"Epoxy matrix magnetic composites with enhanced thermal conductivity.", 9th International Conference on Composite Science and Technology, 24 - 26 April 2013, Sorrento, Naples, Italy.
ORAL

204. K. KOLLBEK, M. SIKORA, J. SZLACHETKO, C. KAPUSTA, M. RADECKA, K. ZAKRZEWSKA
Ti(Cr)O2:N co-doped thin films for energy applications. 01.12.2013 -06.12.2013 2013 Materials Research Society Fall Meeting & Exhibition, Boston, USA
POSTER

205. K. KOLLBEK, M. SIKORA, C. KAPUSTA, J. SZLACHETKO, M. RADECKA, B. ŁYSOŃ-SYPIEŃ, K. ZAKRZEWSKA
Correlation between structural, optical and electrical properties of TiO2:Cr nanopowders,: 16.09.2013 - 20.09.2013 European-Material Research Society (E-MRS) 2013 Fall Meeting, Warsaw University of Technology, Warszawa, Polska.
ORAL

206. K. KOLLBEK, M. SIKORA, C. KAPUSTA, A. TRENCZEK-ZAJĄC, M. RADECKA, A. BRUDNIK, K. ZAKRZEWSKA
Study of N-doped TiO2 thin films for photoelectrochemical hydrogen generation from water., 01.07.2013 - 03.07.2013 International Congress on Materials and Renewable Energy (MRE 2013), Ateny, Grecja.
POSTER

207. A. SZKUDLAREK, W. SZMYT, R. WINKLER, H. PLANK, I. UTKE
Determination of the surface kinetics parameters from Pulsed-Focused-Electron-Beam-Induced-Deposition, 39th International Conference on Micro andNano Engineering, Londyn, 16-19 września 2013
ORAL

208. A. SZKUDLAREK, M, GABUREAC, I. UTKE
Surface Kinetics Aspects of Focused - Electron - Beam - Induced - Deposition, Spring Meeting of European Materials Research Society E-MRS, Strasbourg, 27-30 maja, 2013
ORAL

209. A. SZKUDLAREK, G. GAMEZ, K. ISHIZAKI, S. VAUCHER, I. UTKE
Microplasma and Laser assisted Focused-Electron-Beam-Induced-Deposition. The EuroCVD19 Conference, Warna, 1-6 września, 2013
POSTER

210. A. SZKUDLAREK, A. FERNANDEZ-PACHECO, J. M. DE TERESA, R.CÓRDOBA, M. R. IBARRA, CZ. KAPUSTA
Micromagnetic study of coupling between cobalt nanoelectrodes. Joint European Magnetic Symposia 2013, Rodos, 25-30 sierpnia, 2013.
POSTER

211. M. SKOWRON, D. ZAJĄC, K. SCHNEIDER, CZ. KAPUSTA, T. STRĄCZEK, A. LEMAŃSKI, J. PRZEWOŹNIK A. CIEŚLA, P. SYREK
XAS and magnetometric study of wheat grains. XLVIII Zakopane School of Physics: breaking frontiers: submicron structures in physics and biology : international symposium : May 20-25, 2013.
POSTER

212. T. STRĄCZEK, D. ZAJĄC, K.SCHNEIDER, M. SIKORA, CZ. KAPUSTA, J. TURŁO
XAS study of selenium enriched shiitake mycelium, XLVIII Zakopane School of Physics : breaking frontiers: submicron structures in physics and biology : international symposium : May 20-25, 2013.
POSTER

213. K. SCHNEIDER, D.A. ZAJĄC, D. RYBICKI, J. ŻUKROWSKI, J. PRZEWOŹNIK, M. SIKORA,T. STRĄCZEK, W. PRENDOTA, CZ. KAPUSTA
XAS study of carbon coated Co-Fe nanoparticles, XLVIII Zakopane School of Physics: breaking frontiers: submicron structures in physics and biology : international symposium : May 20-25, 2013.
POSTER

214. K. SCHNEIDER, D.A. ZAJĄC, D. RYBICKI, J. ŻUKROWSKI, J. PRZEWOŹNIK, M. SIKORA, T. STRĄCZEK, W. PRENDOTA, CZ. KAPUSTA
XAS study of carbon coated Co-Fe nanoparticles, KSUPS-10: 10 Jubileuszowe Krajowe Sympozjum Użytkowników Promieniowania Synchrotronowego : Stalowa Wola, 9-11.09.2013.
POSTER

215. S. MANNA, P. L. GASTELOIS, M. DĄBROWSKI, P. KUŚWIK, M. CINAL, M. PRZYBYLSKI, J. KIRSCHNER
"Quantum well states in Cu and oscillatory magnetic anisotropy in Cu/Fe and Cu/Co bilayers" DPG-Fruhjahrstagung, 10-15.03.2013, Regensburg, Germany
ORAL

216. P. KUŚWIK, P. L. GASTELOIS, W. A. A. MACEDO, M. PRZYBYLSKI, J. KIRSCHNER
"Effect of CoO/Ni exchange coupling on perpendicular magnetization of Ni films on Pd(001)"
ORAL

217. S. MANNA, M. PRZYBYLSKI, J. KIRSCHNER
"Scanning tunneling spectroscopy of quantum well states in thin Pd(001) films"
ORAL

218. E. JAL, J.-M. TONNERRE, M. DĄBROWSKI, M. PRZYBYLSKI, J. KIRSCHNER
"Magnetization profile across bcc Fe films as seen by x-ray resonant magnetic reflectivity"
ORAL

219. M. DĄBROWSKI, A. K. SCHMID, M. PRZYBYLSKI, J. KIRSCHNER
"Domain structure in the vicinity of a spin reorientation transition"
ORAL

220. M. PRZYBYLSKI
„X-ray Resonant Magnetic Reflectivity and Magnetization Profile in Thin Fe Films", Seminarium Katedry Fizyki Ciała Stałego, WFiIS AGH 9.04.2013, Kraków
M. Przybylski,„Anizotropia magnetyczna i struktura domenowa widziane mikroskopią spinowo-spolaryzowanych elektronów niskich energii (SP-LEEM)", Środowiskowe Seminarium Fizyki Ciała Stałego, WFiIS AGH, 10.04.2013, Kraków

221. M. PRZYBYLSKI
„Od nanometra do femtosekundy. Granice technologii" (wykład inauguracyjny) AGH University of Science and Technology, 4.10.2013, Kraków

222. M. PRZYBYLSKI
„Gęstość stanów na poziomie Fermiego, a anizotropia magnetyczna"
Środowiskowe Seminarium Fizyki Ciala Stalego, KFCS WFiIS AGH, 4.12.2013, Kraków

223. M. PRZYBYLSKI
„Od nanometra do femtosekundy: granice nanotechnologii”
Seminarium Wydzialowe Wydzialu Fizyki i Informatyki Stosowanej AGH, 6.12.2013, Kraków

224. M. PRZYBYLSKI
„Od nanometra do femtosekundy: granice nanotechnologii”, Seminarium Wydziału Fizyki, Techniki i Astronomii Uniwersytetu Pedagogicznego, 13.12.2013, Kraków

Scientific events

Titles, positions, etc.

PROFESSOR TITLE

KVĚTOSLAVA BURDA
2013-06-25

BARTŁOMIEJ SZAFRAN
2013-11-12

Habilitations and PhD Defenses

HABILITATIONS

MARCIN SIKORA
2013-01-21

MAGDALENA SZCZERBOWSKA-BORUCHOWSKA
2013-02-25

PHD DEFENSES

mgr inż. Kinga Freindl
"Adsorpcja tlenu i wczesne fazy utleniania powierzchni i nanostruktur Fe(110)"
- prof. dr hab. Józef Korecki
- 18.11.2013r

mgr inż. Joanna Świebocka-Więk
"Analiza efektywności wybranych algorytmów redukcji szumu w obrazowaniu magnetyczno-rezonansowym"
- prof. dr hab. Henryk Figiel
– 21.10.2013r

mgr inż. Marcin Wroński
"Modelling and experimental study of asymetric rolling of titanium and aluminium"
- prof. dr hab. inż. Krzysztof Wierzbanowski
- dr Brigitte Bacroix
– 18.10.2013r

mgr inż. Krzysztof Janc
"Micromechanical modeling of bone elastic properties based on computed tomography"
- dr hab. inż. Jacek Tarasiuk
- prof. dr Paul Lipinski
– 18.10.2013r

mgr inż. Paweł Szumniak
"Design and computer simulations of the nanodevices to applications in quantum computing"
- prof. dr hab. Stanisław Bednarek
- prof. dr Bart Paroens
– 14.10.2013r

mgr inż. Michał Nowak
"Electronic structure of artificial atoms and molecules: spin-orbit coupling effects"
- dr hab. inż. Bartłomiej Szafran
- drugi: prof. dr Francois M. Peeters
– 14.10.2013r

mgr inż. Marianna Marciszko
"Diffraction study of mechanical properties and residual stresses resulting from surface processing of polycrystalline materials"
- dr hab. inż. Andrzej Baczmański
- dr hab. Chedly Braham
– 11.10.2013r

mgr inż. Marcin Kowalik
"Właściwości i stany elektronowe $La_{0.33}Pb_{0.33}Mn_{1-x}Fe_xO_3$"
- prof. dr hab. Andrzej Kołodziejczyk
– 04.10.2013r

mgr inż. Kamil Koźlak
"Wpływ wodoru na własności strukturalne i magnetyczne związków RTX (R - ziemia rzadka , T=Ni, Cu, Pd, X=In, Sn)"
- dr hab. Łukasz Gondek
– 24.09.2013r

mgr inż. Joanna Tomkowicz
"Struktura i własności sieci nanoskopowych drutow magnetycznych"
- prof. dr hab. Krzysztof Kułakowski
– 24.09.2013r

mgr inż. Grzegorz Gach
"Measurement of Exclusive Diffractive Dijet Production in Deep Inelastic Scattering at ZEUS Experiment"
- prof. dr hab. Danuta Kisielewska
– 23.09.2013r

mgr inż. Karolina Drogowska
"Effect of hydrogen charging in Ti-V-Ni thin films and their oxides "
- dr hab. inż. Zbigniew Tarnawski
– 23.09.2013r

mgr inż. Michał Zegrodnik
"Unconventional Superconductivity in Correlated Itinerant Magnetic Systems"
- prof. dr hab. Józef Spałek
– 16.09.2013r

mgr inż. Paweł Kuczera
"Structure analysis of selected decagonal quasicrystals"
- prof. dr hab. Janusz Wolny
– 06.09.2013r

mgr inż. Jakub Nowak
"Promieniotwórczo¤ć naturalna wód termalnych Karpat polskich"
- dr hab. inż. Chau Nguyen Dinh
– 12.07.2013r

mgr Barbara Łysoń-Sypień
"Nano-oxide materials for gas sensing"
- dr hab. inż. Katarzyna Zakrzewska
– 17.06.2013r

mgr inż. Szymon Kulis
"Development prototype luminosity detector modules for future experiments on linear colliders"
- dr hab. inż. Marek Idzik
– 22.02.2013r

mgr inż. Dorota Jeleń
"Antropogeniczny dwutlenek węgla w atmosferze Krakowa"
- prof. dr hab. inż. Kazimierz Różanski
– 28.01.2013r

mgr Magdalena Kaczmarska
"Badanie fizyko-chemicznych właściwości erytrocytów zdrowych i zmienionych chorobowo"
- dr hab. Kvetoslava Burda
– 28.01.2013r

Awards

MICHAŁ BOCHENEK

Nagroda Prezesa Rady Ministrów za pracę doktorską:
Development of radiation resistant CMOS integrated circuits for the power distribution system in the upgraded ATLAS Semiconductor Tracker

JOANNA CZUB, ŁUKASZ GONDEK, HENRYK FIGIEL

Nagroda im. Bronisława Znatowicza Polskiego Towarzystwa Chemicznego

KRZYSZTOF MALARZ

Brązowy Krzyż Zasługi III st.

HENRYK FIGIEL

Odznaka Zasłużonego dla Miasta Krakowa "Honoris Gratia"
Nagroda Z.G. P.T.Ch. im. B. Znatowicza za najlepszy artykuł „Wiadomości Chemicznych" w 2012 roku (wspólnie z J. Czub i Ł. Gondkiem)

JOANNA CHWIEJ

Stypendium MNiSW dla wybitnych młodych naukowców, przyznane na lata 2012-2015

S. M. DUBIEL, J. CIESLAK

Nagroda Rektora Zespołowa 1. Stopnia za osiągnięcia naukowe.

J. CZUB, H. FIGIEL, Ł. GONDEK

Nagroda im. Bronisława Znatowicza Polskiego Towarzystwa Chemicznego
za najlepszy artykuł Wiadomości Chemicznych

Organized Conferences

WORKSHOP ON QCD AND DIFFRACTION AT THE LHC
Kraków, November 18 - 21, 2013

THE INTERNATIONAL DAY OF MEDICAL PHYSICS FROM RADIUM TO HADRON RADIOTHERAPY
Kraków, November 7, 2013

DZIEŃ TECHNOLOGII IBM
Kraków, October 24, 2013

CISIM 2013 INTERNATIONAL CONFERENCE ON COMPUTER INFORMATION SYSTEMS AND INDUSTRIAL MANAGEMENT APPLICATIONS
Kraków, September 25 - 27, 2013

ICQ12 12TH INTERNATIONAL CONFERENCE ON QUASICRYSTALS
Cracow, September 1 - 6, 2013
Prof. J. Wolny - chair

ICBAKE 2013 INTERNATIONAL CONFERENCE ON BIOMETRICS AND KANSEI ENGINEERING
Tokyo, Japan, July 5 - 7, 2013

SOIPIX COLLABORATION MEETING
Kraków, May 6 - 7, 2013
Marek Idzik - chair

WOREN 2013, 3RD WORKSHOP ON ORGANIC ELECTRONICS AND NANOPHOTONICS
Złockie, February 17 - 21, 2013
Jacek Nizioł - chair

Faculty Seminars

2013/12/13
dr inż. Grzegorz Jezierski (Muzeum Politechniki Opolskiej i Lamp Rentgenowskich), 100-lecie lampy rentgenowskiej

2013/12/06
prof. dr hab. inż. Marek Przybylski (KFCS WFiIS AGH), Od nanometra do femtosekundy: granice nanotechnologii

2013/11/29
Prof. Thomas Rockmann (Atmospheric Physics and Chemistry Group, Institute for Marine and Atmospheric Research, Utrecht University, The Netherlands) Reconstructing changes in atmospheric trace gases in the industrial era from isotope measurements on air extracted from polar firn

2013/11/22
prof. dr hab. inż. Kazimierz Różański (KZFJ WFiIS AGH), Piąty Raport IPCC

2013/11/15
dr Anna Wnęk (ZOD WFiIS AGH),Pracownia Fizyczna - prezentacja, perspektywy rozwoju i ograniczenia

2013/11/08
Dr Joanna Collingwood (School of Engineering, University of Warwick) Imaging transition metals in the brain: Recent observations with X-rays and Magnetic Resonance Imaging

2013/10/25
Krzysztof Szybiński (Siemens Healthcare), Rezonans magnetyczny - współczesna diagnostyka oczami firmy Siemens

2013/10/18
prof. dr hab. inż. Marek Przybylski (KFCS WFiIS AGH, ACMiN AGH), ACMiN przedstawia i zaprasza

2013/10/11
prof. dr hab. Janusz Wolny, dr hab. inż. Bartłomiej Szafran,
Seminarium dziekańskie

2013/10/04
dr Czesław Ślusarczyk (Zakład Fizyki i Badań Strukturalnych, Instytut Inżynierii Tekstyliów i Materiałów Polimerowych, Wydział Nauk o Materiałach i Środowisku, Akademia Techniczno-Humanistyczna w Bielsku Białej)
Synchrotronowe badania procesu krystalizacji polimerów liniowych w czasie rzeczywistym

2013/09/20
dr Tomasz Ślężak (KFSC WFiIS AGH), Jądrowe rozpraszanie promieniowania synchrotronowego w badaniach magnetyzmu nanostruktur Fe

2013/06/28
dr Piotr Bubacz (Academic Program Manager, Microsoft), Cloud Computing w badaniach naukowych

2013/06/21

dr inż. Bartłomiej Wiendlocha (KFMS WFiIS AGH), Domieszki rezonansowe w materiałach termoelektrycznych

2013/06/14

Prof. Saw Wai Hla (Ohio University, Athens, USA), Frontiers of Nanoscience: Playing with Atoms and Molecules

2013/06/07

dr hab. Piotr Oprocha, prof. AGH (WMS AGH), Powracanie w parach

2013/05/24

dr inż. Bartłomiej Spisak (KISiFK WFiIS AGH), Własności transportowe i lokalizacja stanów jednoelektronowych w układach o zaburzonej symetrii translacyjnej

2013/05/17

dr hab. Kvetoslava Burda, prof. AGH (KFMiB WFiIS AGH),
Zagadkowy układ z żelaza

2013/05/10

dr inż. Jolanta Karpowicz (Centralny Instytut Ochrony Pracy) Zagrożenia bezpieczeństwa i zdrowia związane ze stosowaniem techniki rezonansu magnetycznego i ich odzwierciedlenie w prawie pracy i zaleceniach międzynarodowych

2013/04/26

dr inż. Tomasz Szumlak (KOiDC WFiIS AGH), Powabne piękno Nowej Fizyki - drzewa i pingwiny w LHC

2013/04/19

prof. dr hab. Paweł Olko (Zakład Fizyki Radiacyjnej i Dozymetrii IFJ PAN)
Centrum Cykolotronowe Bronowice rozpoczęło działalność

2013/04/12

prof. dr hab. Józef Korecki (KFCS WFiIS AGH)
LEEM - mikroskopia elektronowa na niskoenergetycznych elektronach, czyli jak obrazować powierzchnie "na żywo" z rozdzielczością nanometrową

2013/04/05

dr Łukasz Bratasz (Instytut Katalizy i Fizykochemii Powierzchni PAN, Laboratorium Analiz i Nieniszczących Badań Obiektów Zabytkowych Muzeum Narodowego w Krakowie), Fizyka w badaniach nad dziedzictwem kultury

2013/03/22

prof. dr hab. inż Andrzej Zięba (KFMS WFiIS AGH), Wielkości fizyczne i pozafizyczne, ich jednostki oraz status prawny

2013/03/15

prof. dr hab. Elżbieta Zipper (IF UŚ), Inżynieria kwantowa funkcji falowych w nanostrukturach

2013/03/08

dr hab. Ryszard Kozera (Wydział Zastosowań Informatyki i Matematyki SGGW i Wydział Matematyki i Nauk Informacyjnych PW), Jednoznaczność rekonstrukcji powierzchni oświetlonej z 2 kierunków

2013/03/01

dr Tomasz Płazak (WFiIS AGH), Ciemna Energia dominująca wszechświat (Nagroda Nobla 2011)

2013/01/25

prof. dr hab. Kazimierz Przewłocki (WFiIS AGH), Efekt cieplarniany

2013/01/18

prof. dr hab. Edward Kapuścik (IFJ PAN), O fatalnym błędzie w fizyce tachionów

2013/01/11

mgr inż. Elżbieta Gadalińska (Instytut Lotnictwa, Warszawa)
Dyfrakcyjny pomiar naprężeń w mikro- i makroskali