JERZY HABER INSTITUTE
OF CATALYSIS
AND SURFACE CHEMISTRY
POLISH ACADEMY OF SCIENCES

RESEARCH REPORT

General information
for years 2010 and 2011

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Introduction

Research

The Jerzy Haber Institute of Catalysis and Surface Chemistry of the Polish Academy of Sciences is the only scientific institution in Poland and one of very few in the world devoted entirely to research in catalysis and the chemistry of interfaces. The Institute pursues interdisciplinary studies of phenomena occurring at gas-solid, gas-liquid and liquid-solid interfaces, combining significant aspects of chemistry, physics, chemical technology, material engineering, and more recently biology and medicine. The fundamental theoretical and experimental studies carried out in the Institute are combined with applied research so that the results obtained can be used directly to improve technological processes.

The Institute employs over 100 people, of whom half are research staff. Approximately 50 PhD students are also involved in research.

The research activity of the Institute focuses on six fundamental areas:

1. Nanotechnology as the basis for new catalytic materials
2. Catalytic processes for sustainable development
3. The modelling of adsorption and catalytic processes
4. The dynamics of nanoparticle and colloidal systems
5. Self-organising structures and functional surface layers
6. Physics and chemistry in cultural heritage protection

In the area of catalysis, much effort is put into developing new, 'intelligent' materials with well-defined structure and properties, tuneable to the requirements of particular catalytic reactions. 'Green chemistry' reactions, optimised to improve energy-efficiency and to eliminate or limit side-products are just some of the major points of interest.

In the field of surface chemistry of dispersed systems, investigations are focused on the description of adsorption phenomena and understanding the mechanism of formation and stability of foams, nano and colloid particles and their interactions, processes of microencapsulation and the biocompatibility of materials.

Experimental studies are carried out in close synergy with theoretical investigations, in which methodologies involving quantum chemistry and solid state physics modelling methods, as well as molecular mechanics and Monte-Carlo simulation techniques are applied.

The investigation outcomes are turned into applications encompassing catalytic materials and processes for pollutant removal to protect the environment, the manufacturing of innovative biomedical materials and the improvement of materials and methods for cultural heritage conservation.

The institute is equipped with state-of-the-art research facilities, in many cases the only such equipment available in Poland. The equipment of joint inter-institute laboratories is also used.

Education

Doctoral programmes at the third-cycle level are established within three frameworks:

- The International Postgraduate School, organised in collaboration with the Faculty of Chemistry, Rzeszów University of Technology.
- The Interdisciplinary Doctoral Programme 'Advanced Materials for Modern Technologies and Future Energetics' coordinated by the Faculty of Physics and Applied Computer Science, AGH University of Science and Technology and the Institute of Nuclear Physics, Polish Academy of Sciences.
- The Interdisciplinary Doctoral Programme (MOL-MED), 'Molecular Sciences for Medicine', which runs in cooperation with the Institute of Pharmacology of the Polish Academy of Sciences, the Faculty of Chemistry of the Jagiellonian University and the Faculty of Medicine, Collegium Medicum of the Jagiellonian University.

In cooperation with the Faculty of Physics and Applied Computer Science of AGH University of Science and Technology, the Institute offers International Doctoral Projects 'Krakow Interdisciplinary PhD-Project in Nanoscience and Nanostructures'.

In the framework of cooperation with high schools, students can develop their Master and Bachelor theses in the field of chemistry and environmental protection.

National cooperation

The Institute has a long-standing tradition of animating and coordinating research in the field of catalysis and surface science in Poland. For over forty years the Institute has organised the annual National Catalytic Colloquium, a key event for the research community in the field. The Institute is a member of several national scientific networks: the Polish Technology Platform of Sustainable Chemistry, the Cluster Life Science, the Consortium 'Nanotech', the Regional Cluster of Information Technologies, the South Poland Regional Cluster of Clean Energy, the Consortium PAN-AKCENT and the National Consortium "Polish Synchrotron".

In order to facilitate interdisciplinary research, joint laboratories have been created: the Centre for Surface and Nanostructure Research (in cooperation with the Faculty of Physics and Applied Computer Science of AGH University of Science and Technology and the Faculty of Chemical Technology and Engineering of Krakow University of Technology), the Inter-institute Laboratory of Enzymatic Catalysis and Biotechnology' (in cooperation with the Institute of Plant Physiology of the Polish Academy of Sciences and the Faculty of Chemistry of the Jagiellonian University) and the Laboratory of Electrochemistry and Surface Chemistry (in cooperation with the Institute of Physical Chemistry of the Polish Academy of Sciences). The Institute is also a co-founder of the National Laboratory for Surface Studies (in cooperation with the Institute of Physical Chemistry of the Polish Academy of Sciences) and SPINLAB – the National Centre of Magnetic Nanostructures for Applications in Spin Electronics.

International cooperation

The Institute is involved in extensive international cooperation. These activities include numerous bilateral international collaboration schemes, research projects of the successive Framework Programmes of the European Union and the European Economic Area, as well as of the Operational Programmes: Innovative Economy and Human Capital, co-financed by the European Commission.

In 2002-2006, the Institute was granted the status of a European Union Centre of Excellence in Molecular Catalysis and Soft Matter Chemistry.

The Institute actively participates in the actions of the COST Initiative.

Popularising research

It is our firm belief that making scientific research easily understandable to society is of immense importance for gaining public support for investment in the field of science, both by state and private institutions. Therefore, every year, the Institute organizes Open-Door Days, during which visitors may listen to popular lectures, participate in spectacular laboratory presentations and attend poster sessions depicting the Institute's research. The Open-Door Days are aimed especially at young people from junior and senior high schools. They are very popular among local schools – every year the Institute receives approximately 1,000 visitors.

The Institute also participates in the annual Krakow Science Festival in the city's Main Market Square. The Institute's staff participate in discussion panels, radio and television broadcasts focussing on research issues.

Research groups and laboratories

Heads of the research groups in italics
Staff members and PhD students as on January 1, 2012.

Adsorption

Professor Władysław Rudziński DSc

Associate Professor Tomasz Pańczyk DSc, Wojciech Płaziński PhD

Colloids I

Professor Zbigniew Adamczyk DSc, PAU member

Jakub Barbasz PhD, Barbara Jachimska PhD, Małgorzata Nattich-Rak PhD,
Lilianna Szyk-Warszyńska PhD, Aneta Michna PhD, Anna Bratek-Skicki PhD,
Krzysztof Jamoroży PhD, Katarzyna Kusak Eng, Maria Morga MSc PhD student,
Magdalena Oćwieja MSc PhD student, Monika Wasilewska MSc PhD student,
Maria Dąbkowska MSc PhD student, Paulina Dąbrowska MSc PhD student,
Kamila Sofińska MSc PhD student, Marta Kujda MSc PhD student,
Katarzyna Kubiak MSc PhD student, Marta Sadowska MSc PhD student

AFM Laboratory
Jakub Barbasz PhD, Małgorzata Nattich-Rak PhD

Colloids II

Professor Piotr Warszyński DSc

Grażyna Para PhD, Ewelina Jarek PhD, Krzysztof Szczepanowicz PhD,
Marta Kolasińska-Sojka PhD, Marzena Noworyta, Eng,
Magdalena Elżbieciak MSc PhD student, Dorota Dronka-Góra MSc PhD student,
Joanna Piekoszowska MSc PhD student, Małgorzata Adamczak MSc PhD student,
Anna Pajor MSc PhD student, Justyna Dziedzic MSc PhD student,
Marek Piotrowski MSc PhD student, Katarzyna Kilan MSc PhD student

Colloids and Self-Assembling Systems

Associate Professor Paweł Weroński DSc

Małgorzata Nosek MSc PhD student, Piotr Batys MSc Eng PhD student
Michał Skoczek MScEng PhD student

Cultural Heritage Research

Professor Roman Kozłowski DSc

Łukasz Bratasz PhD, Michał Łukomski PhD, Leszek Krzemień PhD,
Marcin Strojecki PhD, Bartosz Rachwał MSc PhD student,
Dariusz Wilk MSc PhD student

Dispersed Systems

Professor Kazimierz Małysa DSc

Marcel Krzan PhD, Jan Zawała PhD, Anna Niecikowska MScEng PhD student, Dominik Kosior MScEng PhD student

Electrochemistry of Mineral Systems

Associate Professor Paweł Nowak DSc

Aleksandra Pacuła PhD, Michał Mosiałek PhD, Grzegorz Mordarski PhD, Małgorzata Krzak MScEng PhD student, Maciej Tatko MScEng PhD student

Environmental Control

Tadeusz Machej PhD

Wojciech Rojek MSc, Leszek Matachowski PhD, Łukasz Mokrzycki PhD

Heterogeneous Reaction Kinetics

Associate Professor Ryszard Grabowski DSc

Katarzyna Samson PhD, Małgorzata Ruggiero-Mikołajczyk PhD, Michał Śliwa PhD, Jan Mizera MScEng PhD student

Layered Minerals, Mesoporous Oxides, Nanostructures

Professor Ewa Serwicka-Bahranowska DSc

Małgorzata Zimowska PhD, Roman Dula PhD, Alicja Michalik-Zym PhD, Dorota Duraczyńska PhD, Daria Napruszewska MScEng, Justyna Plona MSc

Heteropolyacids
Katarzyna Pamin PhD, Robert Karcz MScEng PhD student

Homogeneous Catalysis
Jan Połtowicz PhD

Scanning Electron Microscopy Laboratory
Elżbieta Bielańska PhD, Małgorzata Zimowska PhD

Metal-Polymer Systems in Catalytic Hydrogenation

Associate Professor Alicja Drelinkiewicz DSc

Robert Kosydar PhD, Monika Góral PhD, Żaneta Kalemba MSc PhD student

Microcalorimetry Laboratory
Erwin Lalik PhD

Polyoxometalates

Professor Adam Bielański PhD DHC PAN member, PAU member

Anna Micek-Ilnicka DSc, Urszula Filek MScEng

Quantum Chemistry I

Professor Małgorzata Witko DSc PAN member

Renata Tokarz-Sobieraj PhD, Robert Gryboś PhD, Dorota Rutkowska-Żbik PhD,
Maciej Szaleniec PhD, Agnieszka Drzewiecka-Matuszek MSc PhD student,]
Piotr Niemiec MScEng PhD student

Joint Laboratory of Biotechnology and Enzymatic Catalysis
Maciej Szaleniec PhD
Agnieszka Dudzik MSc PhD student, Mateusz Tataruch MsCEng PhD student
Agnieszka Rugor MSc PhD student

Quantum Chemistry II

Professor Ewa Brocławik DSc PAU member

Associate Professor Tomasz Borowski DSc, Anna Wójcik MSc PhD student,
Anna Miłaczewska MSc PhD student

Surfaces, Thin films, Nanostructures

Professor Józef Korecki DSc

Nika Spiridis PhD, Jacek Gurgul PhD, Robert P. Socha PhD,
Dorota Wilgocka-Ślęzak PhD, Kinga Freindl MScEng,
Ewa Madej MScEng PhD student, Barbara Figarska MSc PhD student,
Ewa Młyńczak MScEng PhD student, Tomasz Giela MScEng PhD student

X-Ray Diffraction and Thermoanalysis Laboratory

Professor Wiesław Łasocha DSc

Dariusz Mucha PhD, Anna Szymańska MSc PhD student,
Katarzyna Luberda-Durnaś MSc PhD student, Marta Grzesiak MSc PhD student

Zeolite Chemistry I

Professor Bogdan Sulikowski DSc

Ewa Włoch PhD, Anna Dziedzicka MScEng PhD student,
Dorota Szepietowska MScEng PhD student

Zeolite Chemistry II

Associate Professor Mirosław Derewiński DSc

Jerzy Podobiński MSc, Katarzyna Onik MSc PhD student,
Łukasz Kuterasiński MSc PhD student, Mariusz Gachowski MSc PhD student

Centre for Environmental Pollution Analyses CEPA - CeZAŚ

Joanna Kryściak-Czerwenka PhD

Joanna Opalińska-Piskorz MSc

Research themes and projects

Statutory research – year 2010

Nanotechnology as the Basis of New Catalytic Materials

- Monodispersed, Colloidal Suspensions of the Zeolite Nanocrystals and their Use for the Preparation of New Porous Systems for Catalytic and Sorption Processes
- Structural Properties and Dynamics in epitaxial Oxide and Metal Nanostructures Studied with Microscopic and Spectroscopic Techniques Radiation
- Nanomaterials based on layered minerals
- New Peroxo-compounds of Mo(VI), W(VI) and V(V) – Synthesis, Crystal Structure and Physico-chemical Investigations
- Determination of Electrical and Electrochemical Characteristics of Solid Solutions in Systems M_2O_3-CaO, and CeO_2-M_2O_3-Nd_2O_3, where M = Sm, Gd, in Terms of their Possible Application in Fuel Cells
- Electrocatalytic Properties of Nanostructured Metal Oxides and Metal Oxide/Carbon Composites Prepared with the Use of Hydrotalcite-like Material as a Metal Oxide Precursor

Catalytic Processes for Sustainable Development

- Reduced Copper and Palladium Salts of Heteropolyacids as Bifunctional Catalysts
- Transesterification of Triglycerides with Methanol in the Presence of Zinc-derived Catalysts
- Oxide-Silver Catalyst for Total Oxidation of Organic Compounds
- Transformations of the Monoterpene Hydrocarbons over Micro- and Mesoporous Molecular Sieves
- Ag-ZnO-(ZrO_2) Systems as the Catalysts for Hydrogenation of CO_2
- Comparison of Catalytic Activity of Salen and Porphyrin Cationic Metallocomplexes in Oxidation of Phenol
- Ruthenium Catalysts for Selective Hydrogenation Processes

Adsorption and Catalytic Processes Modeling

- Structural and Electronic Factors in Catalytic Activity of Metal Sites in Enzymes and Nanoporous Materials: Quantum Chemical Investigations
- Molecular Modeling of Enzymatic Reaction Mechanisms
- Properties of Active Centres in Model Heteropolyacids - Cluster and Periodic DFT Investigations
- Modeling the Influence of Surface Heterogeneity and Electrostatic Interactions on the Adsorption Kinetics and Equilibrium of Metal Ions and Protons
- Studies of the Influence of the Translational and Rotational Energies and the Energy Dissipation Mechanism on the Initial Sticking Probability of Water on Platinum Surface Using Molecular Dynamics Simulations

- Studies on the Relationship between Molecular Structure and Chemical Activity of Reagents

Dynamics of Nanoparticle and Colloid Systems

- Determination of the Topology of Globular Proteins on Heterogeneous Interfaces Using the Streaming Potential, Colloid Deposition and AFM Methods
- Influence of pH and Ionic Strength on Profiles of the Bubble Local Velocity in Solutions of Anionic Surfactants

Self-Organized Structures and Functional Surface Layers

- Thin Polymeric Films Containing Nanoparticles and Proteins
- Modeling of Nanoparticle Adsorption – Theoretical Description of Curvilinear Trajectory Random Sequential Adsorption of Spherical Brownian Particle

Physical Chemistry in the Protection of Cultural Heritage

- Monitoring of Preservation State of Surfaces of Historic Objects Using Optical Methods

Statutory research – year 2011

Nanotechnology as the Basis of New Catalytic Materials

- Textural and Structural Properties of Molecular Sieve Nanoparticles
- Structural Properties and Dynamics in epitaxial Oxide and Metal Nanostructures Studied with Microscopic and Spectroscopic Techniques Radiation
- Nanomaterials based on layered minerals
- Proton Ceramic Conductors Containing $BaCeO_3$ as Electrolytes for Solid Oxide Fuel Cells (SOFC)
- Composites Containing Nickel Compounds and Carbon Nanotubes Prepared with the Use of Synthetic Layered Minerals as Potential Electrode Materials for Direct Methanol Fuel Cells (DMFC)

Catalytic Processes for Sustainable Development

- New Peroxo-compounds of Mo(VI), W(VI) i V(V) – Synthesis, Crystal Structure, and Physico-chemical Investigations
- Transformations of Aromatic and Terpene Hydrocarbons on Molecular Sieves of Different Acidity
- Carbon Nanotubes as the Support for Heteropolyacid Catalysts
- Acidic Component Influence on Catalytic Properties of Hybrid Catalysts for Dimethyl Ether Synthesis
- Ceramic Foam Catalysts

- Catalytic Activity and Physicochemical Properties of Anionic Macrocyclic Metallocomplexes in Liposomes

Adsorption and Catalytic Processes Modeling

- Structural and Electronic Factors in Catalytic Activity of Metal Sites in Nanoporous Materials: Quantum Chemical Investigations
- The Dynamics of Oscillatory Heat Evolution in the Sorption of Gaseous Hydrogen in Metallic Palladium as a Function of an Inert Gas Present in a Reaction Mixture and on the Palladium Surface
- Comparison of Properties of Modified Heteropolyacids and Oxides Systems
- Mechanisms of Enzymatic Reactions – Computational Studies
- Molecular Modeling of the Selected Poly- and Oligosaccharides, Their Structural Features and Interactions with Metal Ions
- Theoretical Studies of Structural Transformations Occurring under External Magnetic Field in Systems Composed of Carbon Nanotubes and Magnetic Nanoparticles
- Mechanism of Reaction of NO and CH_4 Molecules on Pd Centres in Mordenite
- Studies on the Coordination Properties of Chlorophyll in Organic sSolvents
- Small Models Theoretical Studies of Benzylsuccinate Synthase Reaction Mechanism

Dynamics of Nanoparticle and Colloid Systems

- Electrostatic Interactions of Nanoparticles with Charge Surfaces Including Many Body Effects
- Physicochemical Background of the Colloid Enhancement Method for Protein Monolayer Detection at Solid/Electrolyte Interfaces
- Influence of the Liquid Film Size on Time of the Bubble Coalescence at the Liquid/Gas Interface

Self-Organized Structures and Functional Surface Layers

- Synergistic Effects in the Photocatalytic Degradation of Organic Pollutants in Water with the Simultaneous Action of Oxidant
- Modeling the Adsorption of Nanoparticles - Multiscale Theoretical Description of the Adsorption Kinetics of Spherical Particles on the Homogenous Surface

Physical Chemistry in the Protection of Cultural Heritage

- Modeling of the Response of Historic Polychromed Wooden Objects to Changes of the Ambient Environmental Conditions

Research Projects of the Ministry of Science and Higher Education

- N 204 089 32/2633 [2007-2010] Mechanism of Catalytic Activity of "Nano-Au/Oxide" in Oxidation of CO
- N 204 122 32/3142 [2007-2010] Employment of Macrocyclic Metallocomplexes of Transition Metal Ions in Self-Assembling Systems for Catalytic Oxidation of Hydrocarbons
- N 204 149433 [2007-2010] The Influence of Kind of Central (P, Si) and Addenda Atoms (W, Mo) in the Silver Salts of Heteropolyacid with Keggin Structure on Direct Decomposition of Nitrogen Oxide NO_x
- N N204 248634 [2008-2011] Multiple Cationic Surfactant Complexes with Polyelectrolytes as Elements of Nanostructures
- N N204 249034 [2008-2011] The Study on the Application of Heterogenized Chiral Ruthenium Complexes in Enantioselective Hydrogenation of Ketones
- N N202 248535 [2008-2011] Exchange-bias Effect in the Epitaxial Systems Obtained by Deposition of the 3d and 4f Metals on Polar and Non-polar Transition Metal Oxide Substrates
- N N301 093036 2009-2011] Molecular Mechanisms Determining Product Specificity of 2-Oxoglutarate Dependent Oxygenases
- N N204 028536 [2009-2012] Developing of the Methods of Formation Biologically Active Multilayers Contained Polyelectrolytes - Proteins - Dendrimers
- N N507 269936 [2009-2012] New Nanostructured Carbon Materials, Oxide Materials and their Composites as Components of Capacitors
- N N105 278536 [2009-2012] Acoustic Emission for Monitoring Museum Objects as a Universal Method of the Preventive Conservation
- N N523 451336 [2009-2012] Controlled Adsorption as a Method of Protection against the Environment Contamination Caused by the Oxidation of Metal Sulfides
- N N204 347737 [2009-2012] Theoretical and Experimental Analysis of Multilayered Spherical Colloidal Particles Porosity
- N N204 026438 [2010-2013] New Method of Evaluating Colloid Particle and Protein Interactions with Interfaces Based on Streaming Potential Measurements
- N N204 291238 [2010-2012] Modeling of Kinetics and Equilibrium of Heavy Metal Ion Sorption by Materials of Biological Origin
- N N204 269038 [2010-2013] Biocatalytic Synthesis of Chiral Alkylaromatic and Alkylheterocyclic Alcohols with Ethylbenzene Dehydrogenase - Theory and Experiment
- N N204 269238 [2010-2013] Functional Nanostructures of Manganese Oxides Doped with Other Metals
- N N507 616638 [2010-2013] Composite Cathodes for Solid Oxide Fuel Cells (SOFC) Working at Temperature 600^{o}C and Lower Containing Silver
- N N204 546439 [2010-2012] New Methods for Powder Diffraction Studies of Structural Materials, Partially Amorphous, Disordered and of Reduced Dimensionality

- N N204 546639 [2010-2013] Stability, Functionality and Mechanism of Creating Polymer-Casein Multilayer Structures
- N N204 205240 [2011-2014] Studies of Structure and Properties of a Magnetically Triggered Molecular Nanocontainer
- N N204 133640 [2011-2014] Influence of Micro- and Nano-bubbles at Hydrophobic Surfaces on Kinetic and Mechanism of the Three Phase Contact Formation in Milliseconds Timescale
- N N204 439640 [2011-2014] Quantum-chemical Studies on the Mechanism of Transmetallation Reaction of Porphyrin and its Selected Derivatives
- N N204 439040 [2011-2014] The New Multi-layered Systems with Controlled Architecture and Functionality
- N N209 757340 [2011-2014] Application of Membrane Emulsification for Formation of Nano- and Microcapsules' Cores

PhD Research Projects of the Ministry of Science and Higher Education

- N 204 2145 33 [2007-2009] Deposition of Model Microcapsules on Metallic Surfaces Modified by Adsorption of Polyelectrolyte Multilayers
- N N205 0189 34 [2008-2010] Influence of Modification of Electron Density of Catalysts Active Centre on Its Activity in Hydrocarbons Oxidation
- N N204 2559 34 [2008-2010] Encapsulation of Active Compounds in Emulsions Cores
- N N204 166336 [2009-2011] Conformations of Selected Globular Proteins in Aqueous Solutions and on Interfaces of Controlled Heterogeneity
- N N204 279937 [2009-2011] The Physico-chemical Properties of Bifunctional Catalysts and their Catalytic Activity in Direct Syngas-to-Dimethylether Process
- N N204 137537 [2009-2011] Mechanisms of Irreversible Adsorption of Nanoparticles and Selected Proteins on Interfaces Determined by Electrokinetic Methods and the AFM
- N N204 179439 [2010-2012] Influence of Cationic Surfactants and pH on Kinetics of the Three-phase Contact Formation at Solid Surfaces of Low Hydrophobicity
- N N105 429140 [2011-2012] Structural Response of Roman Cement Mortars Due to Drying

Iuventus Plus Programme Projects of the Ministry of Science and Higher Education

- Molecular Mechanism of Catalytic Oxidation of Hydrocarbons by Manganese Porphyrins in Solution and on Support [2010-2011]
- Multilayer Polyelectrolyte Films with Catalytic Activity for Biomedical Applications [2010-2011]
- Molecular Basis of Interactions between Calcium Ions and the Selected Uronic Acids [2010-2011]
- Determination of Factors Affecting Stability of Liquid Films Formed During Collision of Gas Bubble With Various Interfaces [2010-2011]
- Application of Nanoparticles/Nanocapsules for Targeted Delivery of Therapeutic Agents [2010-2011]
- Influence of the Type of Active Center and Structure of Macrocyclic Ligand on Catalytic Activity of Metalocomplexes in Liquid Phase Phenol Oxidation [2010-2011]
- New Protein Layered Systems [2010-2011]
- Reaction Mechanism of Nitrogen Oxides Reduction with Hydrocarbons, Catalyzed by Pd-Exchanged Mordenite. Quantum-chemical Simulations [2010-2011]

Scientific Networks of the Ministry of Science and Higher Education

- EKO-KAT Innovative Catalytic Materials in Ecosystem Protection
- SURUZ Surfactants and Dispersed Systems in Theory and Practice (COORDINATION)
- MANAR New Layered Materials of Controlled Architecture and Functionality
- PV-TECH Development of New Technologies and Research Techniques in Area of Photovoltaic Cells
- BIONAN Molecular Mechanisms of Interactions in Biological Nanosystems and in Biologically Active Systems modified with Nanoparticles
- ARTMAG Magnetic Nanostructures for Spintronic Applications

Commissioned Research projects of the Ministry of Science and Higher Education

- PBZ-MEiN-2/2/2006 [2007-2010] Chemistry of Perspective Carbon Transformation
- PBZ-MNiSW-01/I/2007 [2008-2010] Investigations of the Physicochemical Properties of the Passive Layers on Aluminum, Magnesium and Titanium Alloys and Zn-Ni, Zn-Co, Sn-Zn, Co-P i Ni-P Alloy Coatings on Steel
- 0R00003605 [2008-2011] Nanostructural Sorbent for the Spamping out the Chemical Contamination

Technological Initiative I Programme Projects

- Development of a New, Wasteless Technology of Cyclohexanol/Cyclohexanone Synthesis (Intermediates in Nylon 6 and Nylon 66 Synthesis) from Benzene *via* Cyclohexene [2008-2010]

Homing Plus Programme Projects

- Structure and Electric Properties of the Composite Films Containing Conductive Nanoparticles [2010-2012]

Pomost Programme Projects of the Polish Foundation for Science

- Selective Hydrogenolysis of Glycerol to Glycols via Acetol on Heterogeneous Metal/metal Oxides Based Catalysts [2011-2014]

EU 6th Framework Programme Projects

- EC 6th FP NMP2-011730-2 IDECAT [2005-2010] Integrated Design of Catalytic Nanomaterials for a Sustainable Production (NoE)
- EC 6th FP ERA-NET MATERA Project NANOMEDPART [2007-2010] Multifunctional Particulate System for Nanomedicine (SPR-COORDINATION)
- EC 6th FP ERA-NET MNT Project PARFUN [2008-2011] Nanoscale Surface Treatments to Functionalise Polymer Particles for Electronic Application (SPR)
- EC 6th FP ERA-NET MNT Project NANOREP II [2008-2011]Multifunctional Surface Coatings and Highly Scratch Resistant Plastic Parts (SPR)

EU 7th Framework Programme Projects

- EC 7th FP SCP7-GA-2008-218447 InGAS [2008-2011] Integrated Gas Powertrain – Low Emission, CO_2 Optimised and Efficient CNG Engines for Passenger Cars and Light Duty Vehicles (CP)
- EC 7th FP CP-IP 229183-2 NEXT-GTL [2008-2011] Innovative Catalytic Technologies & Materials for Next Gas to Liquid Processes (IP)
- EC 7th FP MUST [2008-2011] Multi-level Protection of Materials for Vehicles by "Smart" Nanocontainers (CP)
- EC 7th FP 212939 SMOOHS [2008-2011]Smart Monitoring of Historic Structures (FRP) EC 7th FP 226898 ROCARE [2009-2012] Roman Cements for Architectural Restoration to New High Standards
- EC 7th FP CP-IP 228867-2 F3 [2009-2013] F3 Factory Flexible, Fast and Future Factory - European Chemistry Consortium Begins the Journey into the Future of Production

EU COST Actions Projects

- EC COST D36 [2006-2011] Molecular Structure-Performance Relationships at the Surface of Functional Materials
- EC COST D43 [2006-2011] Colloid and Interface Chemistry for Nanotechnology
- EC COST IE0601 [2006-2011] Wood Science for Conservation of Cultural Heritage
- EC COST P21 [2006-2010] Physic of Droplets

EEA Financial Mechanism Projects

- EEA PL0084 NOMRemove [2007-2010] Effective Photocatalytic-Membrane Methods of Removal of Organic Contaminants for Water Treatment
- EEA PL0086 [2007-2010] Establishing Standards for Allowable Microclimatic Variations for Polychrome Wood

Projects of EU Structural Funds Programmes

- PO IG 1.1.2 [2008-2012] MPD Krakow Interdisciplinary PhD Projects in Nanoscience and Advanced Nanostructures
- PO KL 4.1.1 [2008-2012] ISD Advanced Materials for the New Technologies and Energy of the Future
- PO IG 2.2. [2009-2011] SPINLAB National Centre of Magnetic Nanostructures for Applications in Spin Electronic
- PO IG 1.3.1. [2009-2014] BIOTRANSFORMACJE Biotransformations Useful in Pharmaceutical and Cosmetics Industry
- PO IG 2.1.1. [2009-2014] FUNANO Functional Nano- and Microparticles, Synthesis and Applications in Innovative Materials and Technologies
- PO IG 2.1.1. [2009-2014] VOX Development of Technology for Synthesis of Nanostructured Oxide Catalysts for Purification of Air from Toxic Volatile Organic Compounds
- PO IG 1.1. [2010-2013] TEAM-FNP AMON Atomic and Molecular Level Devising of Functional Nanostructures for Magnetic and Catalytic Applications
- PO KL 4.1.1 [2010-2015] ISD NANOMED Molecular Sciences for Medicine

Other International Projects

- GRDE France [2007-2010] Enzymes as Nanotools - Development of a New, Enzyme-Based Technology for Engineering Selectivity Permeable, Nano-Structured Membranes
- GDRI France [2007-2010] Catalysis for Environment Depollutation, Renewable Energy and Clean Fuels

- Intergovernmental Polish-Austrian Project [2009-2010] Adsorbates on Fe Monolayer on W(110)
- Intergovernmental Polish-French POLONIUM Project [2010-2011] Metal and Oxide Epitaxial Nanostructures as Seen by Nuclear Resonance Scattering of Synchrotron Radiation

Other Activities

- Sixth Edition of the University Textbook "An Introduction to Inorganic Chemistry”
- Centre of Environmental Pollutants Analysis CEZAS
- Preliminary Evaluation of Application of Molecular Simulation for Evaluation of Polymer Adhesion
- Experimental Study on the Deposition of Rhenium and Its Alloys, Especially Alloys of the Composition Close to 'so called' Superalloys, on the Metallic Substrate by Electrolysis
- Spectroscopic Ellipsometry Measurements of Polymeric Layer Thickness and the Analysis of Structure of Thermoactive Polymeric Layers for Cell Culture

Scientific output of the institute

Grouped by years 2010 and 2011

Printed scientific publications

Books

1. A. Bielański, "Podstawy Chemii Nieorganicznej" (M. Galus, ed.), Wydawnictwo Naukowe PWN, Warszawa 2010, wydanie szóste zaktualizowane i uzupełnione, [ISBN: 978-83-01-16281-8 tom 1, 978-83-01-16282-5 tom 2]

Special issues of journals

1. "Jerzy Haber - a man who wanted to know and to understand. Sixty years of activity in the field of chemistry and catalysis", Catalysis Today [special issue (P. Nowak, M. Witko, Eds.)], 169 (2011) 257 pages

Reviews and chapters in monographs

1. Z. Adamczyk, M. Nattich, A. Bratek, "Adsorption and Deposition of Particles, Polyelectrolytes and Biopolymers", in: "Nanoscience: Colloidal and Interfacial Aspects" (V. Starov, ed.), Taylor & Francis, Oxford-New York 2010, Chapter 21 [ISBN 978-1-4200-6500-8]

2. Z. Adamczyk, M. Nattich, M. Zaucha, "Electrokinetics of Particle Covered Surfaces", Current Opinion in Colloid and Interface Sci., 15 (2010) 175-183

3. Z. Adamczyk, K. Sadlej, E. Wajnryb, M. Nattich, M.L. Ekiel-Jeżewska, J. Bławzdziewicz, "Streaming Potential Studies of Colloid, Polyelectrolytes and Protein Deposition", Adv. Colloid Interface Sci., 153 (2010) 1-29

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133. M. Oćwieja, Z. Adamczyk, M. Morga, A. Michna "Tuning Silver Particle Monolayer Structure and Density via Controlled Adsorption-desorption Processes", 25th Conf of European Colloid and Interface Society ECIS, Berlin 2011

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135. T. Pańczyk "Crucial Prerequsities for a Functional Magnetically Triggered Nanocontainer", 54 Zjazd PTChem i SITPChem, Lublin 2011

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142. W. Płaziński "Calcium Alginates: Structure, Dynamics and Thermodynamics. Insights from the Molecular Modeling Studies", Conf. on Applied Theory on Molecular Systems, Hyderabad 2011

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151. D. Rutkowska-Żbik, A. Drzewiecka-Matuszek, M. Witko "DFT Studies on Catalytic Activity of Manganese Porphyrins", 15th Int. Symp. on Relations between Homogeneous and Heterogeneous Catalysis, Berlin 2011

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155. M. Strojecki "Bezpieczeństwo obiektów w trakcie zmiany sposobu zarządzania mikroklimatem", EnviControl Final Workshop, Kraków 2011

156. M. Strojecki, Ł. Bratasz, M. Łukomski "Acoustic Emission for Tracing Damage in Wooden Artworks", World Conf. on Acoustic Emission, Beijing 2011

157. M. Strojecki, C. Colla, M. Łukomski, E. Gabrielli, Ł. Bratasz "The Kaiser Effect in Wood - Does Historic Wood Have Stress Memory?", European Workshop on Cultural Heritage Preservation EWCHP-2011, Berlin 2011

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165. T. P. Warzocha, T. Pańczyk "The Nanocapsule: Drug Delivery System Composed of Carbon Nanotube and Magnetic Nanoparticles. Monte Carlo Studies", Annual World Conf. on Carbon 'Carbon 2011', Shanghai 2011

166. D. Wilk, Ł. Bratasz "Spękania w zabytkowych zaprawach romańskich - wyjaśnienie mechanizmu ich powstawania za pomocą metod fizykochemicznych", 11. Konf. Wydziału Chemii Uniwersytetu Warszawskiego 'Analiza chemiczna w ochronie zabytków], Warszawa 2011

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Conferences and scientific events organized by the institute

1. International Workshop 'Allowable Microclimatic Variations for Polychrome Wood', Oslo, February 18th-19th, 2010 (R. Kozłowski, Ł. Bratasz)

2. MUST EC 7th FP Project Workshop, Krakow, March 10th, 2010 (P. Warszyński)

3. XLII Ogólnopolskie Kolokwium Katalityczne, Kraków, 15-17 marca 2010 (B. Sulikowski).

4. Workshop on Photocatalysis and its Application in Removal of Contaminants, Krakow, March 17th-18th, 2010 (P. Nowak)

5. Seminarium Klaster Life Science, Kraków, 30 marca 2010 (E. Serwicka-Bahranowska)

6. International Workshop 'Modeling Mechanical Behaviour of Wooden Cultural Objects', Krakow, April 12th-13th, 2010 (M. Łukomski)

7. Warsztat 'Ochrona drewna polichromowanego: zarządzanie klimatem w budowlach zabytkowych i muzeach'; Warszawa, 20 kwietnia 2010, (R. Kozłowski)

8. 3rd Meeting 'X-Ray Techniques in the Investigations of the Objects of Cultural Heritage: Around Rembrandt and His Workshop', Kraków, May 13th-16th, 2010 (R. Kozłowski, W. Łasocha)

9. US-Poland Workshop & Summer School 'Nanoscale Phenomena in Materials and at Interfaces'; Krakow, June 6th-10th, 2010 (Z. Adamczyk)

10. 10th Pannonian International Symposium on Catalysis, Krakow, August 29th-September 2nd, 2010 (M. Derewiński)

11. Symposium "Women Sharing a Chemical Moment in Time", Kraków, January 18th, 2011 (M. Witko, D. Rutkowska-Żbik)

12. XLII Ogólnopolskie Kolokwium Katalityczne 'Nowe procesy katalityczne', Kraków, 16-18 marca 2011 (B. Sulikowski)

13. International Spring School BES 'Novel Techniques for Nanobiological Sciences', Krakow, May 7th-12th, 2011 (B. Jachimska)

14. XXIst International Symposium on Bioelectrochemistry and Bioenergetics of the Bioelectrochemical Society (BES), Krakow, May 8th-12th, 2011 (B. Jachimska)

15. Konferencja "HITY-2011 Zastosowanie teorii w badaniach molekularnych", Kraków, 18-20 maja 2011 (M. Witko, R. Tokarz-Sobieraj)

16. Joint Final Conference of COST Actions IE0601 and MP0601, Paris, November 14th-18th, 2011 (R. Kozłowski, Ł. Bratasz)

17. EnviControl Final Workshop, Kraków 2011, Krakow, November 23rd, 2011 (R. Kozłowski, Ł. Bratasz)

18. Symposium "Women in Science", Warszawa, November 25th, 2011 25.11.2011 (M. Witko, D. Rutkowska-Żbik)