Cooperation in industry-oriented research in an enlarged Europe

Info- and brokerage event in new technologies and materials (FP7/2007: NMP/ICT)

Calls (topics) of Interest for 2007 on ICT and NMP

ICT-2007.3.6: Micro/nanosystems

NMP-2007-1.1-2 Self-assembling and self-organisation
NMP-2007-2.1-2 Nanostructured coatings and thin films
NMP-2007-2.1-3 Characterisation of nanostructured materials

NMP-2007-2.2-1 Organic materials for electronics and photonics

Institution (Organisation)

Institution:
Babes-Bolyai University of Cluj-Napoca
Faculty of Chemistry and Chemical Engineering
Department of Physical Chemistry
Laboratory: Physical Chemistry of Nanostructured Multifunctional Systems
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Experience in European projects 2000-2006

Participation to European Projects:

We have long term bilateral scientific cooperation with University of London, King's College, U.K., Philipps University of Marburg, Germany, University of Paris South, Paris, France, Aristotle University of Thessaloniki, Greece, and others. Our joint publications of scientific research articles, books and patents represent a traditional way to share the achievements from our research and innovative activity.

We have a strong interest to cooperate in a consortium that deals with nanosystems and nanostructured multifunctional materials, in which we take care of nanofabrication and characterization methods.

Competence / resources

Our Physical Chemistry Laboratory of Nanostructured Multifunctional Systems contains the following sections: **self-assemblies, thin films, nanostructures and biomaterials**. The main research activity in this laboratory consists of the synthesis of nanoparticles and the functionalisation of various surfaces as well as the fabrication of thin films, coating layers and nanostructured multifunctional materials. Besides common self-assembling techniques, we also use the **Langmuir-Blodgett technique** that offers the possibility to build up monolayers and planar thin films from various biocompounds (e.g. lipids, fatty acids, amino acids, proteins, polymers, DNA and drugs) at controlled lateral surface pressures. Also, we have state of the art equipments, such as **Scanning Probe Microscopy**, i.e. **AFM** and **STM**, coupled with **advanced spectroscopic methods** for micro and nanostructure investigations.

Also, we have state of the art equipments for high precision interfacial lateral pressure and surface potential measurements, *e. g.* **Langmuir technique**, and for the bioengineering interfacial fabrication of thin films and nanostructured materials, *e.g.* **Langmuir-Blodgett technique**, and possess expertise in this field. These measurements and equipments are used to build planar nanometer sized supramolecular structures at different interfaces.

Our research and innovation activity is developed in collaboration with **7 Romanian partners** from **3** Universities, **3** National R & D Institutes and **1** Institute of the Romanian Academy. From consortia, our laboratory benefits of many other state of the art techniques and equipments, such as **FTIR, FT-Raman, NMR, ATR, X-ray diffraction, scattering techniques, DSC calorimetry and other surface imaging techniques (e.g. TEM and SEM).**

Highly qualified human resources.

We have developed original methods of synthesis for **controlled size and shape of noble metal nanoparticles** and **fabrication for multifunctional coatings, thin films and nanostructured materials** with **potential industrial, biological and medical applications as well as for analytical and chemical biosensors and optical nanodevices.**

We have developed **interfacial nanofabrication methods** including improved **Langmuir-Blodgett technique**, besides **spin coating, auto-aggregation and deposition through adsorption on interfaces**. The nanostructures are thoroughly investigated by advanced spectroscopy (**UV-Vis, ^{1}H NMR, FTIR, FT-Raman, ATR**), **X-ray diffractions, DSC calorimetry,** and different **surface methods (TEM, SEM, AFM and STM).** Our group and collaborators have also high expertise to investigate the **structure of proteins** by FTIR, FT-Raman spectroscopy, ^{1}H NMR and X-ray diffraction and scattering techniques and for simulation and modeling of N-terminal amino of proteins.

Proposals / interests

ICT-2007.3.6: Micro/nanosystems

Our research and innovation activity is directed to several national projects in collaboration with partners from universities and research institutes dealing with micro and nanosystems. All projects are developed in the field of nanoscience and nanotechnology. Thus, micro and nanostructures are fabricated based on nanoparticles of gold, functionalized gold surfaces and nanostructured multifunctional materials, e.g. based on globular protein, amino acids, chitosan and gold nanoparticles. The main focus is to develop new nanostructured materials and biocomposites for industrial, analytical, sensing, biological and medical applications.

NMP-2007-1.1-2 Self-assembling and self-organisation

The gold nanoparticles are synthesized in our laboratory by various methods leading to the controlled size and shape of nanoparticles, nanoclusters and colloidal nanocrystals. We have scientific interest in self-assembly and auto-organisation of nanoparticles of noble metals, functionalized by different biocompounds. These nanostructures can be obtained by different preparation methods. They lead to novel multifunctional nanostructured biomaterials and to planar supramolecular structures important for nanoscience and nanotechnology. Another recent direction is to design, fabricate and characterize novel multifunctional materials for bone tissue engineering and regenerative medicine.

NMP-2007-2.1-2 Nanostructured coatings and thin films

Globular protein extracted from aleurone cells of barley is under investigation in our laboratory (i.e. the secondary protein structure changes) when subjected to heat or γ-irradiation. The nanostructured protein coatings and thin films as well as the protein in its solid state present high stability against the heating process up to 68 Celsius degrees and irradiation environment. On the other hand, the nanoscale functionalized gold surfaces and multifunctional thin films realized in our laboratory from amino acids, lipids, proteins, DNA and other biocompounds with or without anorganic compounds or nanoparticles of noble metals present potential biological, medical and industrial applications.

NMP-2007-2.1-3 Characterisation of nanostructured materials

We have state of the art equipments and technology to characterize the nanostructure of different materials, such as AFM, STM, TEM, SEM, advanced spectroscopic methods (FTIR, FT-Raman, UV-Vis, NMR, DSC, X ray diffractions and scatterings. Recently, the multifunctional nanostructured material, based on globular protein, chitosan and gold nanoparticles, was obtained by appropriate nano-scale structural design. The obtained multifunctional material has a high stability, good mechanical properties and reproducible optical properties to be used in optical devices or sensing devices.

NMP-2007-2.2-1 Organic materials for electronics and photonics

Organic materials, based on proteins, peptides, carbohydrates and other organic molecules, are tailored for electronic, optical and sensing properties to be used in applications for **electronics and photonics organic devices.** Up to now, we have developed several strategies for nanofabrication of nanostructured organic materials.

Further info on-line Brokerage:
www.minos-euro.net/brokerage