



NATIONAL R&D INSTITUTE FOR NONFERROUS AND RARE METALS

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The Nanostructured Materials Laboratory is founder member of the Romanian Technological Platform for Nanomedicine (RO-NANOMED). The Laboratory was recognised and funded as a Centre for Excellence in the frame of the National Virtual Centre for Nano-bio-technologies CENOBITE.

MISSION: Fundamental and applied research works in the field of chemical methods for synthesis of ceramic, composite and hybrid composite nanomaterials for functional and structural applications with emphasis to *nano-bio-materials for regenerative medicine and tissue engineering*.

MAIN EQUIPMENTS

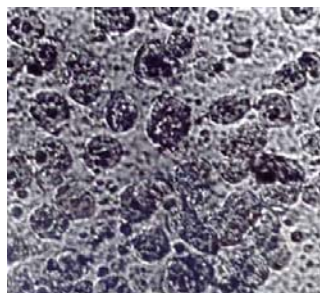
- Clean room for the synthesis of new nano-biomaterials;
- Computer-controlled hydrothermal-electrochemical system for synthesis of nanopowders and electrodepositing of thin films (Unique in Europe);
- Sol-gel colloidal synthesis pilot plant and spin-coater equipment.
- Powders processing equipments: ball milling, hydraulic press, ovens, chamber furnace CARBOLITE (air/controlled atmosphere) at 1800°C, tubular furnace MHI (air/controlled atmosphere/vacuum) at 1740°C; UV-VIS spectrometer T90+PG Instruments.
- Software for thermodynamic predictions; software for electrochemical studies
- Collaboration with the chemical and structural characterisation laboratory of the institute.

ACHIEVEMENTS

➤ Advanced Technologies for the synthesis and processing of biocompatible nanocomposite powders- Acronym Bionanocom (2003-2005)

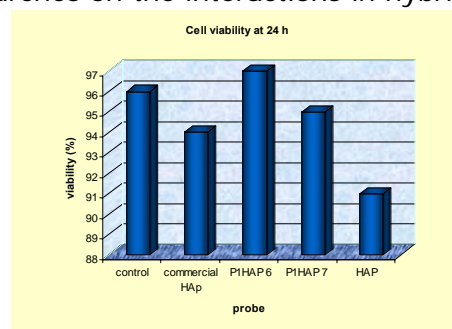
Matnantech Project 3060269

Participants: IMNR (Project Director Dr. Roxana M. Piticescu), Inst. Macromolecular Chemistry Petru Poni Iassy, Inst. Chemical Pharmaceutical Research Bucharest, SENCO PLASMA CER srl, RO.



The main objective of the project was the development of non-conventional hydrothermal methods for obtaining of biocompatible composite nanostructured powders in the system calcium phosphate-polymers, development of biocompatible sintered materials for biocompatibility tests, fundamental researches on the interactions in hybrid systems, studies of the correlations between microstructure and biocompatibility properties. The studies have shown an enhanced biocompatibility of the new hybrid

materials compared to pure HAP. A patent demand was deposited by participants. Progresses in high pressure synthesis of nanomaterials with special emphasis on new hybrid organic-inorganic nanomaterials for different applications were reported also in COST D30 workgroup actions.

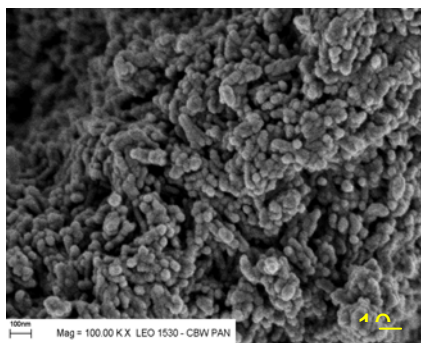


➤ Integrated technology Research Network in advanced biocompatible structures for dental implants

Research for Excellence Project **CEEX 46 ReteBdent (2005-2008)** Project web page

www.retebdent.imnr.ro

Participants: INCDMNR (Project Director Dr. Roxana M. Piticescu), Inst. Macromolecular Chemistry Petru Poni Iassy, University POLITEHNICA-Centre BIOMAT, Institute for Biochemistry Bucharest, Romanian Academy, University of Medicine and Pharmacy Carol Davila Bucharest, National Institute for Materials Physics Bucharest, SITEX 45 srl.



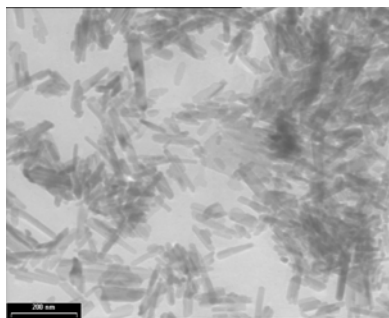
The aim of the project is to obtain advanced structures based on hybride nanocomposites polymer-calcium phosphate as coating materials for different metallic substrates (Ti, TiAl6Nb7, TiAl5Fe2.5), metallo-ceramics having core-shell structure (stainless steel for the core and alumina for the shell) or doped zirconium dioxide, which will be tested from the point of view of biofunctional performances for dental implants applications. The proposed nanostructures to be obtained in the frame of the project, the substrates to be used and also the deposition techniques (hydrothermal-electrochemical and MAPLE) represent an absolute novelty at national level. The hydrothermal-electrochemical technique is also an european priority. The main result of the project is represented by the analysis regarding the compatibility

between the inovative deposition techniques (hydrothermal-electrochemical and MAPLE techniques), on the one hand and structure, film properties and the strategy to participate in the frame of the NANOMEDICINE technical platform, on the other hand.

➤ **Integrated technologies for obtaining nanostructured biocomposites with applications in the regenerative medicine of bone tissue**

Research for Excellence Project CEE X 16 TECOREMED (2005-2008)

Coordinator National Institute for Chemical and Petrochemical Research ICECHIM. In charge of Project from INCDMNR Director Dr. Roxana M. Piticescu.



The main objective of the project is to obtain and characterise different binary and ternary hybrid nanostructured biocomposites, comparison of their properties and elaboration of a strategy for development of the research in the field of hybrid materials for regenerative medicine. The main role of INCDMNR-Nanostructured Materials is the soft chemical elaboration of hybrid nanomaterials based on calcium phosphates, titanium dioxide, silicates and carbon aerogel with different natural and synthetic polymers by in-situ hydrothermal methodologies. Process modelling and simulation of the processes is an important task to obtain materials with controlled biocompatible properties.

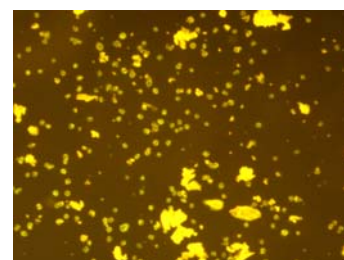
➤ **Hybrid nanostructured thin films for biosensors and biobanks**

Bilateral project in the frame of Greek-Romanian Agreement in the field of Scientific Research

Participants: INCDNMR-IMNR, project director Roxana M. Piticescu

INASCO Hellas, Athens, project director George Maistros

Project aims to develop a new generation of self-assembly hybrid materials as sintered membranes and nano-structured transparent thin films with controlled selectivity for biological molecules and also for studying their optical, electrical and/or magnetic properties as a function of composition, microstructure and adhesion degree of biological cells, the final task being the development of new biomaterials and biosensors with increased biocompatibility. This includes to study "in-situ" functionalisation of ceramic particles using copolymers, obtaining hybrid compact nanomaterials used as standard samples for characterization of their properties and biocompatibility, developing thin hybrid nanostructured thin films with controlled porosity and mechanical properties by **innovative methods**.



➤ **Accreditation of a laboratory for chemical-physical characterisation of nano-bio-materials**

Research for Excellence Project – Module dedicated to the development of research infrastructure and development of accredited characterisation methods (2006-2008)

Location: INCDNMR-IMNR, project director Adrian M. Motoc

high quality equipments (mainly XRD and AAS) will be installed and specific methods for characterisation of nanobiomaterials will be accredited for the use of both research and SMEs partners.

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