



THEORETICAL AND APPLIED PHYSICAL CHEMISTRY RESEARCH CENTRE
UNIVERSITY OF BUCHAREST

CONTACT PERSONS

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FACILITIES

The Centre offers various facilities of investigation:

- rotating meniscus equipment and various static and dynamic tensiometric methods
- spectrophotometric and spectrofluorimetry methods
- cyclic voltametry
- dynamic light scattering
- video enhanced microscopy
- diffusion cell
- bidimensional Langmuir balance
- miniextruder (monodisperse liposomal system)

Other activities: organization of conferences and symposiums- "Conference on Physical Chemistry", "Symposium of Colloid and Surface Chemistry" and co-editor to Journal of Colloid and Surface Chemistry

AREAS OF NANOTECHNOLOGY RESEARCH

- v NANO(BIO)TECHNOLOGY FOR MEDICAL APPLICATIONS: Drug encapsulation
 - v LONG TERM RESEARCH WITH GENERIC APPLICATIONS: Self assembly
- The aim of current research includes:
- v developing new methods to obtain ordered synthetic and natural compounds 2D and 3D architectures at nanometric scale, for future device applications;
 - v structural and theoretical characterization of the nanostructured materials;
 - w modeling self-assembly of organized nanostructures;
 - v characterization of low and high energy surfaces and composite surfaces at nanoscale size.

CURRENT PROJECTS

- " Fluid and Biocompatible Nano and Microstructures for Controlled Transport of Some Active Hydrophilic Substances" - 521/2000 Contract in "Horizon 2000" National Programme, subsidiary programme " New materials, technologies and microsystems for the quality of life and environment" - Collaboration with Laboratoire de Chimie Organique et des Substances Naturelles, Ecole Nationale Supérieure de Chimie de Rennes, France
- "The Interaction of Cholesterol and Dehydroepiandrosterone avec Mimetic Membranes (liposomes, double emulsions)" - Collaboration with:
 - Institute of Physical Chemistry "I.G. Murgulescu" of Romanian Academy, Bucharest, Romania
 - Laboratoire des Matériaux Catalytiques et Catalyse en Chimie Organique, Ecole Nationale Supérieure de Chimie de Montpellier, France

R E S U L T S

LIPOSOMES

Liposomes have attracted considerable interest as a drug delivery system, much of that interest in the liposomal carriers originated because these are colloidal nanostructured systems consisting of one or more lipid bilayers. Depending upon the chemical composition and the methods of preparing, the chemical and physical properties of the vesicles can be tailored to specific needs. An almost unlimited number of potential dosage forms can be formulated, making this type of carrier a versatile drug delivery system for both hydrophilic and hydrophobic active substances.

- „Semi-empirical and Ab-initio Computation of Interactions between a 2-Pralidoxime Cholinesterase Reactivator with Cholesterol and Dehydroepiandrosterone Steroids", Josette Weinberg, Mihaela Olteanu, Manuela Dudau, Dan Lerner, Constantin Balaceanu-Stolnici, The 3rd International Conference of the Chemical Societies of the South-Eastern European Countries, Bucharest, sept. 2002

MICROEMULSIONS AND DOUBLE EMULSIONS

The research was focused on the preparation and characterization of some soft condensed colloidal systems (emulsions, multiple emulsions and microemulsions) as vehicles for hydrophilic drugs. The materials used were vegetable oils and pharmaceutical accepted surfactants.

- Olteanu M: "Fluid Micro and Nanostructures for Cosmetic and Pharmaceutical Uses" In Micro and Nanostructures, Romanian Academy Ed, 2001, pag. 199-215, ISBN 973-27-0836-0.
- Olteanu M, Cinteza O, Dudau M, Mircioiu C in "NBC Risks", Sohs T and Voicu VA (eds) Kluwer Academic Publishers, Dordrecht, The Netherlands, 1999, 389-400
- Olteanu M, Stoian C, „Appreciation upon Concentrated Double Emulsions Stability", Proceedings of the VII-th Symposium of Colloids and Surface Chemistry, Bucharest, sept. 2002, pp 30-35
- Mandru I, Olteanu M: "Surfactants-Association Colloids", ARS

DOCENDI Ed., Bucharest 2001, 263 pp, ISBN 973-8118-89-1

- Dudau M, Olteanu M: "The forces implied in stabilization of colloidal systems", ARS DOCENDI Ed., Bucharest 2001, 96 pp, ISBN 973-8118-93-X.
- Contreras P, Olteanu M: "Interfacial Tension Measurement by the Rotating Meniscus", Colloid Surfaces, 2000, 170, 45-50.

NANOPARTICLES AND NANOCAPSULES

Many kinds of particles have been synthesized in W/O microemulsion systems: TiO₂, CaCO₃, BaCO₃, CuSO₄, particles for photographic emulsions. Among these particles, semiconductors are especially interesting - CdS and CdSe, and also the composite particles CdS-ZnS and CdSe-ZnS.

- Peretz S, Olteanu M, Cinteza O, Dudau M: "A New Method for the Preparation of Copper Sulfate Ultrafine Particles", Rev. Roum de Chimie, 46, 2002.

Other current researched are focused on the obtaining and characterization of biodegradable micro and nanoparticles from biopolymer materials as drug delivery systems.

- Olteanu M, Mandru I, Dudau M, Peretz S, Cinteza O, "The Aqueous Liquid/Liquid Interphases Formed by Chitosan-Anionic Surfactant Complexes", Progress in Colloid & Polymer Science, 2002.

LANGMUIR BLODGETT MONOLAYERS FOR NANOSTRUCTURED SENSORS

Langmuir Blodgett multilayers have often been used for the construction of highly ordered ultrathin films with special properties owing to their supramolecular structure. LB layers may be used for modeling of biological and interfacial processes.

- Olteanu M, Algarra L, Noiret N, Cinteza O, Dudau M: "Monolayers of Some Catanionic Surfactants at Air - Water Interface", The 10th Conference on Physical Chemistry, Iasi, sept. 2000, S7 PO 20.

COOPERATION PROPOSAL

Obtaining of some fluid nano and microstructures with applications in drug delivery systems and food technology and as nanostructured medium for preparation of particles, capsules and fibres.

- o The nanotechnology of very hydrophilic bioactive substances encapsulation in microemulsions, double emulsions and biocompatible synthetic, natural and mixt liposomes.
- o Interaction of dehydroepiandrosterone incorporated in nanostructured mimetic membranes with very hydrophilic cholinesterase reactivators.