



Romanian Academy

Institute of Physical Chemistry "Ilie Murgulescu"

LABORATORY OF CHEMICAL THERMODYNAMICS

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The Laboratory of Chemical Thermodynamics is a leading laboratory for basic and applied thermodynamic research.

The research team of the Laboratory of Chemical Thermodynamics comes from the Institute of Physical Chemistry "I.G.Murgulescu" of Romanian Academy. This Institute stands as a unit of complex research that may approach a wide spectrum of basic and advanced problems of physical chemistry and materials science. The contribution is based on the former research experience existing in the Laboratory of Chemical Thermodynamics as concerns the large potentialities offered by the Applied Chemical Thermodynamics to characterize and investigate from the energetic point of view the advanced materials involved in the complex modern systems and the new technologies

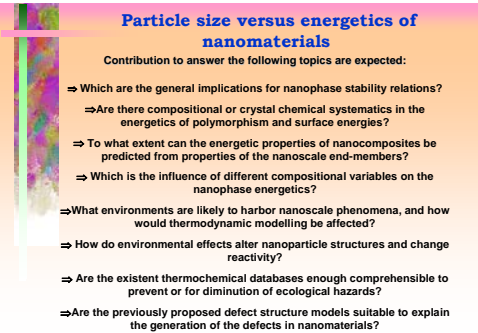
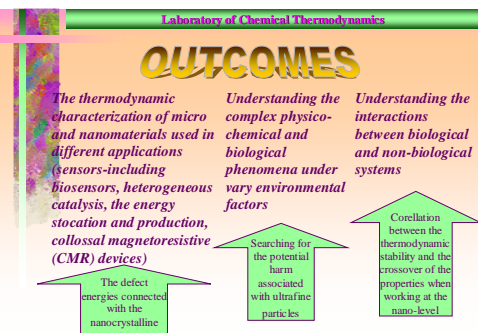
Main areas of interest in FP7

(A). Nanosciences, Nanotechnologies, Materials and new Production Technologies (NMP)

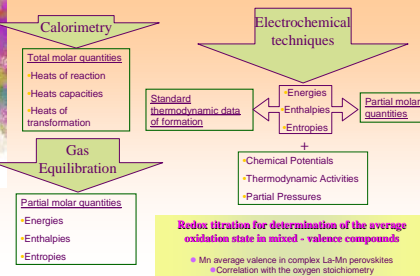
- A careful evaluation of the trade-off between structure, the grain size (method of preparation), thermodynamic stability
- The understanding of the property dependence on compositional variables: the key to enable optimization and full exploitation of multifunctional materials
- The control of the energetic parameters: important step in understanding the stability, possibilities to interaction with the biological systems and the environmental effects of on nanoparticles.

(B) Life sciences and biotechnology

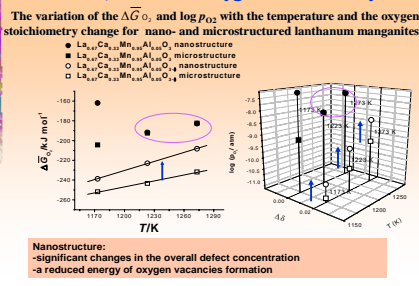
- The thermochemical study of biological compounds (amino acids, peptides, proteins, bacteria and yeasts) as basic compounds and models for a better understanding of living organisms
- The study of influence of ionizing radiation (gamma) on thermal behaviour of biological compounds as a useful test for utilization of gamma radiation in sterilization and preservation foods.
- Thermochemical characterization of the collagen with alcohols mixtures used for the bones prothesis
- Thermodynamics of binding interactions



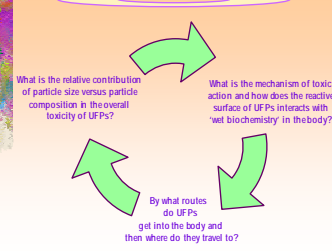
Experimental Techniques for Thermodynamic Measurements



Nano-, micro- and oxygen stoichiometry



Questions about UFPs



Participant in the FP6 CA Project "Improving the understanding of the impact of nanoparticles on human health and the environment - ImPart"

Project objectives:

To prevent knowledge of the health and environmental implications of nanoparticles from lagging behind the technological advances.

In order to do this, ImPart will foster communication links between numbers of regional, national and international initiatives in order to reduce duplication of effort, pool expertise and facilitate co-operation between networks.

❖ This will result in an improvement in the understanding of the potential impact of nanoparticles on human health and the environment.

IPC tasks:

- The Laboratory of chemical thermodynamics (Dr. Speranta Tanasescu) is involved in the actions of the project having the principal goal understanding of the short and long term implications of nanotechnology for health and the environment. The contribution in the project is based on the former research experience existing in the Laboratory of Chemical Thermodynamics as concerns the large potentialities offered by the Applied Chemical Thermodynamics to characterize and investigate from the energetic point of view the advanced materials involved in the complex modern systems and the new technologies. Contribution to answer the following questions are expected:
 - To what extent can the energetic properties of nanocomposites be predicted from properties of the nanoscale end-members?
 - Which is the influence of different compositional variables on the nanoparticle energetics?
 - What environments, besides the now familiar aqueous low temperature setting, are likely to harbor nanoscale phenomena, and how would thermodynamic modelling be affected?
 - Which environmental factors and in what extent they are responsible for the interactions between biological and non-biological systems?
 - Are the existent thermochemical databases enough comprehensible to prevent or for diminution of ecological hazards?

Summary and Concluding Thoughts

- Small particle and nanostructured materials chemistry is relevant to many subjects, including health and environmental topics
- There are many different types of small particle and nanomaterials effects as well as many delightful opportunities and scientific challenges
- In contrast to macrothermodynamics, the thermodynamics of a small system will usually be different in different environments
- More and better tools and their use are essential to characterize the properties and environmental effects of on nanoparticles (multidisciplinary analysis is required). Theory and modeling are useful to successful work in this

Laboratory of Chemical Thermodynamics

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INTERNATIONAL PROJECTS:

- Participant in EU project on "Improving the understanding of the impact of nanoparticles on human health and the environment" (ImPart CA, Programme: Priority 3 - NMP, 2005-2007)
- Scientific cooperation with ETH Zurich, Department of Materials - Institute of Nonmetallic Materials, Thermodynamic Group, Switzerland concerning "The thermochemical properties of the compounds in the La-Sr-Mn-O system". Agreement on the scientific collaboration 2001-2005.
- Scientific cooperation with the Institute of Metallurgy and Materials Science "Aleksander Krupkowski" of the Polish Academy of Sciences, Laboratory of Physical Chemistry concerning "The investigation of the influence of phase nonstoichiometry on phase equilibria in Mn-Eu-O system". JRC Project 2003-2005
- Romania - Bulgaria bilateral academic cooperation, "Optimization of Hydrogen and Oxygen Electrodes for Proton Exchange Membrane Fuel Cells Application" JRC Project, beginning with 01/01/2005
- Participant (Nov 2004 - June 2005) in EU COST Action 525, Advanced Electrochemicals: Grain Boundary Engineering, the Project "Structural and electrochemical studies of impurity ferroelectrics"
- Participant in EU "Joule II Programme", Sub-Programme "Energy Conservation and Utilisation" (Contract JOU 2-CT 92-0053 "New SOFC Materials and Technology" (Contract JOU 2-CT 92-0053 "New SOFC Materials and Technology", 1993-1995)
- The EC5R(1959-1972) contract with IAEA-Vienna "Thermodynamic properties of the uranium oxides"

