

Postgraduate Students Seminar 2014

February 7th & 10th, 2014

“Health, Safety and Environmental Implications of Synthetic Nanomaterials”

Professor Miguel A. Bañares
Institute of Catalysis and Petroleum Chemistry, CSIC, Spain

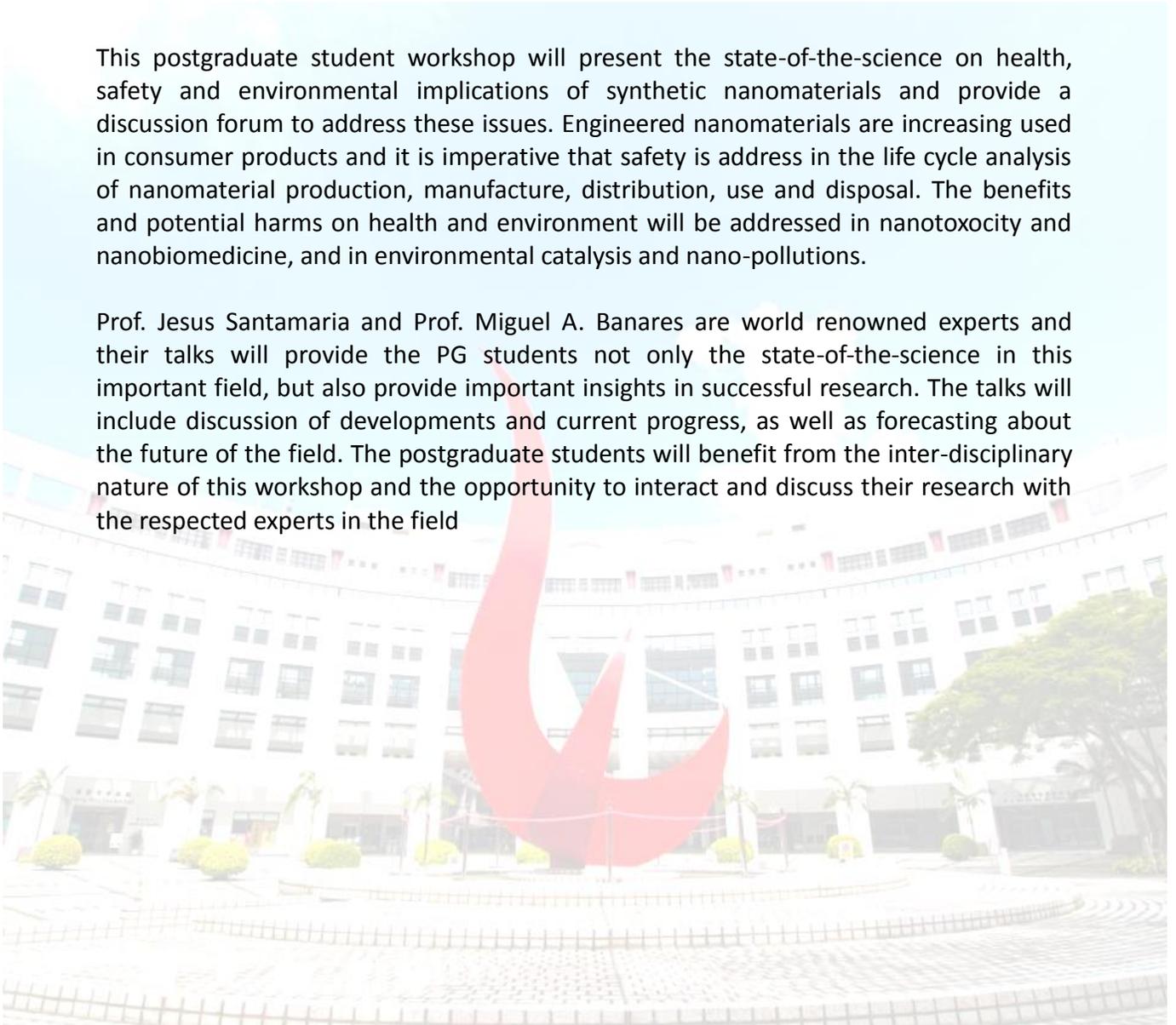
Professor Jesus Santamaria
Vice-Director of Nanoscience Institute of Aragon (INA) and Professor of
Chemical and Environmental Engineering, University of Zaragoza, Spain

Sponsored by
Postgraduate Student Conference/Seminar Grants (PSCG), Research Grants Council; and
William Mong Institute of Nano Science and Technology (WMINST)

Objectives of the Seminar

This postgraduate student workshop will present the state-of-the-science on health, safety and environmental implications of synthetic nanomaterials and provide a discussion forum to address these issues. Engineered nanomaterials are increasingly used in consumer products and it is imperative that safety is addressed in the life cycle analysis of nanomaterial production, manufacture, distribution, use and disposal. The benefits and potential harms on health and environment will be addressed in nanotoxicity and nanobiomedicine, and in environmental catalysis and nano-pollutions.

Prof. Jesus Santamaria and Prof. Miguel A. Banares are world renowned experts and their talks will provide the PG students not only the state-of-the-science in this important field, but also provide important insights in successful research. The talks will include discussion of developments and current progress, as well as forecasting about the future of the field. The postgraduate students will benefit from the inter-disciplinary nature of this workshop and the opportunity to interact and discuss their research with the respected experts in the field



Program Schedule

Online Registration:

https://docs.google.com/forms/d/1JWPp9wl_6Bepv66xsiKtp7enDDPWekDAzP1-rZDEABs/viewform

Friday 7th February 2014 (venue : 1504, 1/F, near lift 25-26)

14:00 - 14:30	Registration
14:30 - 15:30	Prof. Miguel A. Bañares <i>Surface science for toxicology of nanoparticles</i>
15:30 - 16:30	Professor Jesus Santamaria <i>Nanosafety: Safe handling of nanostructured materials</i>
16:30 - 17:15	Open Discussion

Monday 10th February 2014 (venue : 1504, 1/F, near lift 25-26)

09:00 – 09:30	Registration
09:30 - 10:30	Professor Jesus Santamaria <i>Temperature-triggered drug delivery systems: NIR and magnetic activation cles</i>
10:30 - 11:30	Prof. Miguel A. Bañares <i>Catalysis for a better environment: Intensification and remediation</i>
11:30 - 12:15	Open Discussion

About the Speakers

Prof. Dr. Miguel Banares

Prof. Banares is the Technical vice-Director of the Institute of Catalysis, CSIC, the President of COST Action D36 and Full Research Professor of CSIC. He is now ASSOCIATE EDITOR for Catalysis Today (Elsevier) and Editorial Board Member of Catalysis Today (since 2003), Applied Catalysis (2004-2009), Catalysis Letters (since 2006), Topics in Catalysis (since 2006), among others, and member of the founding international advisory board of Operando Conferences and has been co-organizer of Operando-I, III and IV conferences, and main organizer of Operando-II conference in 2006. His research in nanocatalysis for Green chemistry and pollution abatement are very well known as well as his emphasis on understanding the molecular action as the key to better material and process design.

Prof. Dr. Jesus Santamaria

Prof. Dr. Jesus Santamaria is the vice-Director of the Nanoscience Institute of Aragon (INA), the Head of the Nanostructured Films and Particles group and Professor of Chemical and Environmental Engineering at the University of Zaragoza. He was the Director of Research for Regional Government of Aragon (2003-2007) and he spearheaded the establishment of INA as the foremost research institute in nanoscience in northern Spain. He has received numerous awards including the 3M Innovation Award, Honeywell-UOP Lectureship, Perez Castro Award, SAMCA Professorship of Nanotechnology. He is world renowned for his work on nanostructured and nanoporous materials their forming and applications in sensors and medicines.

Abstracts

February 7

SEMINAR 1: ***Surface science for toxicology of nanoparticles.***

Prof. Dr. Miguel A Banares (CSIC, Madrid, Spain)

Nanotechnology is recognised as one of the most important new technologies of the 21st century. The market size for nanotechnology is expected to grow to over \$3 trillion by 2015 with an estimate of 50,000 products containing engineered nanomaterials (ENM). Nanotechnology promises new materials for industrial applications by having new or enhanced physico-chemical properties that are different in comparison to their bulk or micron-sized counterparts. However, as in all industrial applications, the potential exposure of humans and the environment to these materials is inevitable. Identifying and quantifying the relationship between ENM properties and the biological responses can be done by using Quantitative Nanostructure-Toxicity Relationships (QNTR) models. However, we need appropriate descriptors of the inorganic nanoparticles, descriptors that are relevant to reactivity and toxicity. We present the surface science approach to understand toxicity of nanoparticles.

SEMINAR 2: ***Nanosafety: Safe handling of nanostructured materials.***

Prof. Dr. Jesus Santamaria (U. Zaragoza, Zaragoza, Spain)

Nanotechnology and nanotech products are already part of our daily life and have become an economic reality. The production rates of several nanomaterials are estimated at hundreds or even thousands of ton/year, and there are over 3000 commercial products in the market that contain nanostructured materials. Engineered nanomaterials (ENMs) are of a varied nature regarding their chemical composition and morphology, and every day the production of new nanomaterials with exciting properties is announced at many laboratories around the world.

The possibility of nanomaterials having an adverse impact on human health and the environment has been a cause for concern for a number of years. Special care must be exercised with emerging ENMs, whose novel characteristics give rise to new properties and applications but at the same time may also give rise to unwanted health effects. We will examine some of the key aspects in handling nanomaterials, with special focus on the possibility of unintended generation of nanoparticle aerosols, and the protective measurements that can be taken with moderate cost/effort.

February 10

SEMINAR 1: *Temperature-triggered drug delivery systems: NIR and magnetic activation*

Prof. Dr. Jesus Santamaria (U. Zaragoza, Zaragoza, Spain)

Medical practice relies heavily in enteral (usually oral) and parenteral drug administration. However, these methods do not afford an easy to control of the rate of drug release or of the dose received at a certain location, their ability to target the diseased tissues or organs is limited, and unwanted side effects in healthy tissues often occur. Thus, a controlled drug delivery system is highly desirable to increase the efficiency and selectivity of therapeutic efforts. New drug delivery vehicles can be static (e.g., medical devices such as polymer-coated stents; drug-eluting prostheses, skin patches) and mobile (e.g. injectable nanoparticles), and may be capable of passive (e.g. controlled by diffusion or by vector degradation) or active (triggered) drug delivery. This talk will describe recent research in our laboratory aimed to the creation of temperature- activated drug delivery systems. We use embedded nanoparticles that are sensitive to near-infrared (NIR) radiation or to magnetic fields, as a way to produce a local temperature increase that triggers drug delivery.

SEMINAR 2: *Catalysis for a better environment: Intensification and remediation*

Prof. Dr. Miguel A Banares (CSIC, Madrid, Spain)

Catalysts are responsible for the production of over 60% of all chemicals and are used in some 90% of all chemical processes worldwide, improvements in catalytic design will end to improvements in chemical process, including the use of novel feedstock, and lowering energy and water consumption. Thus, process intensification is best suited to reduce energy demand and CO₂ emissions to its minimum. Process intensification is defined in the European Roadmap for Process Intensification to “provide radically innovative principles (“paradigm shift”) in process and equipment design which can benefit (often with more than a factor of two) process and chain efficiency, capital and operating expenses, quality, wastes, process safety and more”. Process intensification hence aims at a drastic enhancement of economic and ecologic efficiencies of chemical processes. On the other hand, catalysis is also a tool to destroy contaminants. As a whole, the efficient implementation of catalytic processes will help first to minimize contamination and second to remediate existing contamination.