

## WORKSHOPS

### WL-01. Basic X-ray Diffractometry in Fundamentals of Nanoscience

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To those interested to the field, this workshop introduces the principles of X-ray diffractometry (XRD) and develops a systematic experiment overviewing the technique, the instrumentation configuration and the mathematics required to interpret results with emphasis in fundamentals of nanoscience. In the second half of the workshop, a code program will be developed including routines to suppress background, smooth the raw data, and stripping the Ka<sub>2</sub> contribution. Finally, the code will be employed to study the microstructure of the analyzed specimen using two models of microstructure for describing their capabilities and applications in actual practice of nanomaterials characterization. BYOD (Bring Your Own Data) for a more active discussion!

### WL-02. Nanotechnology in Cosmetics: Learning about Liposomes and Nanoemulsions

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Nanotechnology in cosmetics: Liposomes and nanoemulsions in the development of high penetration skin formulations for the skin. The workshop emphasizes on high penetration systems in dermal tissue and their effectiveness / safety.

### WL-03. An Approach to Bionanotechnology and Bacterial Cultures: Production of Magnetic Nanoparticles

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Procurement of natural nanoparticles is a challenging task that requires the identification of the proper organisms for their isolation. Furthermore, there are naturally recurring nanoparticles with interesting properties like magnetism

which can be exploited in different technological applications. Magnetospirillum griphywaldense is a bacterium that produces magnetic nanoparticles to direct itself towards ideal growth conditions in nature. However, the nanoparticles it produces have been scarcely used in technological environments. This workshop pretends to guide the attendees in the different strategies to obtain, purify and use these natural-occurring magnetic nanoparticles and to open a discussion of different applications that can be envisioned for them.

#### **WL-04. The Use of the "Dynamic Light Scattering, DLS" Method as a Tool for the Characterization of Nanoparticles Size**

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Dynamic Light Scattering (DLS) has emerged as an important technique to characterize size distribution profiles of small particles in suspension or in solution. Industrially, this technique has several applications that allow a thorough understanding of processes where particle size, specially in the nano-scale is an important factor. This workshop pretends to give the attendants a hands-on understanding of the technique and the procedures needed regarding sample preparation and analysis. For this, several proteic solutions will be analyzed and characterized according to their size and isoelectric points which can be of great interest in the pharmaceutical industry. Proteins by themselves are polymers and their relevance in the nanotechnological field is increasing so this workshop will certainly be of interest to a broad audience.

#### **WL-05. Nanocancer: Learning about the Recovery of Cellular Nanovesicles from Cancer Lines**

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Although there is no scientific consensus, it is well-established that cancerous processes in mammals are the result of several factors occurring in a cellular level. One of this is currently believed to be originated by exosomes. Exosomes are nanovesicles naturally produced by all cell types. However, it is hypothesized that exosomes from cancer cell lines carry genetic information that stimulate the formation and propagation of tumors. Their recovery and study are not trivial tasks. This workshop aims to give the attendees a broad glimpse into the different strategies being used to recover and characterize exosomes from different cancerous cell lines.

#### **WL-06. Dendritic Nanostructures for the Purification of Biomolecules**

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Recovery of biomolecules is a procedure of the utmost importance in industrial environments. Purification stages in a process tend to represent over the 80% of the total production cost. Nanotechnology now offers advantages where traditional bioseparation unit operations can be enhanced with the use of different modifications. This workshop will focus on the development of chromatographic supports modified with dendrons which are branched chemical structures that allow the incorporation of specific chemical moieties for the purification of certain biomolecules. Their unique structure offers the possibility of generating chemical clusters that allow better separations. This workshop will show in a practical manner the different possibilities available in the use of dendrons in bioseparations.

#### **WL-07. X-ray Photoelectron Spectroscopy: Fundamentals and Applications in Nanomaterials**

Organizer & Instructors:

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X-ray photoelectron spectroscopy (XPS) consists in measuring the kinetic energy of ionized electrons coming from the inner orbits of the atoms. It is used to obtain quantitative information of the chemical states and to study the valence band of the first atomic layers of solid materials (1-100 Å) with high precision. In this workshop, some theoretical and experimental aspects of the techniques will be discussed, namely, X-ray Photoelectron Spectroscopy (XPS / ESCA) and Ultraviolet Rays (UPS), Auger Electron Spectroscopy (AES), and Depth Profiles by Ionic Erosion using XPS. Strategies are exposed to obtain more information about the technique and the adequate parameters for the measurements and the adjustments in the deconvolution of spectra are detailed. The main application in research are analysis of oxidation states in various disciplines and fields such as nanomaterials, carbon, metals, polymers and functionalization of surfaces, organic materials, tribology, diffusion processes, thin films, catalysis, semiconductor materials and superconductors, among others.