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PREFACE

A cornerstone of the global development of science and technology in different fields involves phenomena and materials occurring at the nanoscale. This is represented in a number of state of the art contributions gathered in this proceedings volume from *Symposium 1D: Nanostructured Materials and Nanotechnology* at the XXIV International Materials Research Congress which was held from August 16-20, 2015 in Cancun, Quintana Roo, Mexico, as described below.

Reactivity of chemical species to metallic nanoparticles is related to the exchange of electrons between them, which is tightly related with the work function of the metallic system. Also, as the miniaturization of electronic devices is developing very fast, it is important to address the role of the work function, when the dimensions of the systems reach the nanoscale. In this sense, Olivier Pluchery and co-workers open the volume with a paper where they have determined the spontaneous charging behavior of gold nanoparticles, which let them measure the work function of 10 nm nanoparticle size, opening the way for single electron devices, such as memories or transistors.

Gravila and Gravila present a review of the greatest challenges for magnetic recording, both from the fundamental points —physical limits and energetical considerations— and from engineering —grain density for higher recording density, control of the signal-to-noise-ratio, etc. Thus, they give a wide and clear picture of the alternative *bit-patterned-magnetic-media,* which consists on mono-dispersed high-anisotropic nanoparticles in a self-organized pattern. These systems have been intensively studied over the last few years and are the most promising hierarchical nanostructures for obtaining ultra-high recording density on hard disk drives.

At nanoscale, the properties of matter drastically change and are mostly enhanced, read typically with the *super* prefix, and thus the challenge is to obtain control of these enhanced properties. One of the preferred techniques from the nanotechnology-toolbox that scientists frequently apply for prediction of properties for this goal is the use of molecular dynamics simulations. Mejia-Rosales and Fernández-Navarro present a study on the mechanical properties under elongation and compression of gold and silver nanowires. Their results clearly show that elastic properties of these metallic nanowires are influenced by the atomic structure and specifically that nanowires with five-fold symmetry become stronger than those with face centered cubic (fcc) atomic packing. This result is important when designing new nano-electronic devices, for example.

In this 2015 proceedings issue of the *Symposium 1D: Nanostructured Materials and Nanotechnology,* we present the works related to fabrication (sol-gel, sputtering, wet-chemistry, CVD, etc.) and characterization of nanostructured materials by a diverse variety of techniques (SEM, TEM, XPS, TGA, etc.) for a diverse spectra of applications such as nanomedicine, where Balcázar-Pérez *et al.,* present functionalized magnetic nanoparticles

(NPs) for use in photodynamical therapy of cancer, and Chávez *et al.,* set bioimaging with engineered NPs with the property of upconversion of light –from the NIR to the VIS regions.

Biological functionalization application is presented by Pineda-Pimentel *et al.,* on the chitosan hydrogels, as well as Campos-Cornelio *et al.,* on chitin nanowhiskers, where chitosan is a natural cationic biopolymer present in the exoskeletons of crustacean, insects, and some fungi, with high biodegradability, nontoxicity and antimicrobial properties, and thus, with potential applications in nanomedicine; Jaramillo *et al.* present the system of controlled mesoporous silica for different applications: adsorption, ions exchange, separation, catalysis, sensors and drug delivery.

In catalysis applications, González-Zavala *et al.,* present Ag:V_2O_5 thin films, as alternative systems for wastewater treatment for the removal of organic pollutants, such as pesticides, dyes or organic compounds present in the aqueous phase. For potential sensing applications, Granados-Martínez *et al.,* present interesting CVD carbon nanotubes (CNTs) production, following the principles of green chemistry and sustainability.

Antimicrobial properties are presented by Tomacheski *et al.,* in the evaluation of the antimicrobial properties of polymeric matrices containing silver organo-modified bentonite and organo-chlorine molecules for treatments against bacteria.

Mechanical properties are presented by García-González *et al.,* in the TiAlNO quaternary system characterized by its interesting mechanical properties, high electrical resistivity, good thermodynamic stability, and resistance to oxidation, thus a material suitable for applications such as a diffusion barrier in integrated circuits, as hard coating in industrial metal working type, transparent polymers processing, and electrodes in microelectro—mechanical—devices. Also, Jaramillo *et al.,* propose the system of magnesium-aluminium (Mg/Al) and hydrotalcite nanocomposites with enhanced mechanical properties and thermal stability.

For photoemission and a myriad of opto-electronic applications, Reynoso *et al.,* present co-doped hafmium dioxide (HfO_2) multilayers; and finally for photovoltaics, Hernandez-Montero *et al.,* present a detailed study of the structure and optoelectronic properties with varying experimental parameters of nano-meso-structured silicon films made by radio-frequency plasma-enhanced chemical vapor deposition.

Nanotechnology is now termed the scientific and technological revolution of s. XXI. Behind the most visible and potential applications of nanotechnology, such as electronics, energy storage and conversion, nanomedicine, catalysis, etc., there exist driving force concepts such as those already mentioned above, and thus we hope that this 2015 MRS proceedings volume from the *Symposium 1D: Nanostructured Materials and Nanotechnology* at the XXIV International Materials Research Congress will be a representative sample of the current nanotechnology research.

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