Programa

Hora	Actividad
9:30	Acreditaciones
10:00	Presentación de las Jornadas
10:30	Dr. Carlos Rinaldi (Argentina)
11:15	Coffee break
11:30	Dr. Corrado Di Natale (Italia)
12:15	Dr. Ivan Elmi (Italia)
13:00	Almuerzo
14:30	Dra. Gabriela Leyva (Argentina)
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16:30	Mesa redonda
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Miércoles 5 de Octubre

9.30hs. Acreditaciones

10:00hs. Presentación de las Jornadas por autoridades de Comisión Nacional de Energía Atómica y la Embajada de Italia.

10:30hs. "Micro y Nanoestructuramiento de Materiales Inducido por Ablación Láser" Dr. Carlos A. Rinaldi (Argentina) Departamento de Micro y Nanotecnología, GAIyANN, CAC, CNEA - CONICET

La irradiación de sólidos con láser en el régimen de nanosegundos tiene como característica principal elevar la temperatura de una capa superficial. Si dicha temperatura es suficientemente grande como para cambiar el estado de agregación del material, este se fundirá y gradualmente se evaporará. El material evaporado puede interaccionar con los pulsos subsecuentes, generando así un plasma con temperaturas electrónicas de varios miles de grados. El material eyectado puede incluir átomos neutros y moléculas, iones positivos y negativos, cúmulos, electrones y fotones. El proceso que incluye la interacción del láser con el sólido, así como el inicio y expansión del plasma es conocido con el nombre de *Ablación Láser*.

En cada una de las etapas del proceso de ablación láser existen muchos fenómenos tanto físicos como químicos de gran interés, no solamente desde el punto de vista teórico, sino también en el desarrollo tecnológico e industrial.

Después de que el láser intenso ha interaccionado con el sólido, este dejará una huella permanente en el material, modificando en algunos casos, no sólo sus propiedades ópticas y electrónicas sino también su morfología superficial.

El procesamiento de materiales inducido por láser tiene aplicaciones industriales muy importantes, como por ejemplo en micro-mecánica, metalurgia, óptica integrada, manufactura de semiconductores y actualmente en la opto-electrónica y en la nanotecnología.

11:15 Coffee break

11:30 "The Chemical Sensitivity of Nanometric Porphyrins Assemblies"

Dr. Corrado Di Natale Departamento de Ingeniería Electrónica, Universidad de Roma Tor Vergata; Italia

The rich chemistry of metalloporphyrins provides a large variety of interaction mechanisms that can be exploited for chemical sensing. [1] The role of the metal ion is considered of primary importance to determine the sensitivity and selectivity properties of the macrocycle, by coordination of the volatile molecule; but also hydrogen bonds polarization, and polar interactions may be present and cooperate in the total guest molecule binding. This chemical versatility offers also the possibility to drive self-assembled molecular aggregations to form ordered geometrical structures such as rods, rings, wires, nanofibers, and three-dimensional lattices [2]. Geometrical arrangements of metalloporphyrins may also induce an amplification of properties such as chirality [3] and optical anisotropy [4].

Such molecular aggregations are hold together by weak forces that are subjected to a modulation due to the adsorption of molecules from either gas or liquid phase. This fact complements the proper sensitivity of metalloporphyrins providing a further source of sensitivity that can be exploited for chemical sensing. Examples of this concept will be provided considering optical absorbance changes occurring in self-aggregated

porphyrin nanotubes formed by opposite ionic porphyrins [5]. In this system the sensitivity of the aggregates largely exceeds the sensitivity of individual porphyrins demonstrating the added value provided by the supramolecular structure. Another example is concerned with the peculiar sensing properties of ordered scaffolded porphyrin solids [6].

Another example will be concerned with the changes of Reflectance Anisotropy Signals (RAS) of a ordered layer of porphyrins ordered by Langmuir-Schäfer technique [7]. RAS is a powerful method to study the optical arrangement of a surface, and in case of organic layers, it provides information about the large-scale order of the molecular aggregation. Results show that RAS spectra are sensitive to gas adsorption and more importantly, different interaction produce distinct optical signatures that can allow for a recognition of the adsorbed molecule [8].

Finally, the sensing properties of hybrid materials formed by metalloporphyrins and carbon nanotubes [9] and metalloporphyrins and ZnO nanorods [10] will be illustrated as a further methodology to fabricate porphyrins based chemical sensors.

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12:15hs. "Microsystem Technologies for physical and chemical sensing: activities at CNR-IMM Bologna" Dr. Ivan Elmi- CNR – IMM Boloña- Italia

In the last ten years CNR-IMM Bologna institute has being involved in microsystems technologies. The technological facilities available and know-how acquired in MEMS development, simulation, fabrication and characterization has allowed to develop different sensing devices based on chemical and physical transduction principles. These devices were developed for the following application fields: atmosphere composition monitoring, single photo detection, strain measurement, ink-jet fluid delivery. In the presentation we will show the technological solutions adopted to fabricate the various sensors, together with some examples of complete microsystems relying on the MEMS sensors.

13:00 hs. Almuerzo

14:30 hs. Óxidos Nanoestructurados: Síntesis, Caracterización y Aplicaciones
Dra. Gabriela Leyva. Dpto. de Física de la Materia Condensada, GIyA, Comisión Nacional de Energía Atómica - Escuela de Ciencia y Tecnología, UNSAM

El creciente interés en la nanotecnología se debe a su amplio rango de aplicaciones tales como las electrónicas, comunicaciones ópticas y asociadas a sistemas biológicos, entre otras. Esto se evidencia en la exhaustiva exploración de nuevos materiales y nuevas morfologías de materiales conocidos. En ese sentido estamos estudiando la nanoestructuración de óxidos con aplicaciones tecnológicas.

En esta charla presentaremos los resultados de las síntesis de varios óxidos simples (de estaño, silicio, titanio, etc.), óxidos mixtos (de manganeso, de cobalto, etc.) y soluciones sólidas (óxidos con sustituciones estructurales) en forma de nanopartículas ensambladas formando estructuras tubulares huecas (tubos) o sólidas (hilos). En cuanto a los óxidos nanoestructurados tubulares se sintetizan usando como molde films de policarbonato poroso. Los poros del molde de policarbonato se llenan con la fase líquida correspondiente a la fórmula química deseada y se los somete a los tratamientos térmicos adecuados a la composición y estructura cristalina deseada. Para ello se emplea un método con dos etapas térmicas, la primera por irradiación con microondas y la segunda en un horno por convección. Estas estructuras tubulares pueden ser adheridas sobre la superficie de sustratos sólidos inorgánicos durante el proceso de síntesis. Exploramos su utilización como materiales catalíticos en sensores de gases, cátodos de celdas de combustible sólidas (SOFC), catalizadores y estudiamos exhaustivamente las propiedades magnéticas por su potencial uso en spintrónica y como dispositivos de memoria y lectura magnetorresistivo.

Respecto a las aplicaciones biomédicas haremos referencia a la síntesis de nanopartículas magnéticas tipo core-shell (perovskitas de manganeso-SiO_2) con el objetivo de obtener un ferrofluido biocompatible destinado a la terapia oncológica por la técnica de hipertermia magnética. En esta síntesis se ha empleado el método de polimerización de citratos (liquid-mix) para la obtención de nanopartículas y el método de Stöber para el recubrimiento de las mismas.

15:15hs Coffee break

15:45 hs. Nanoscience and Nanotechnology of Metal Oxides for Gas Sensing and Advanced Applications. Dr. Giorgio Sverbeglieri. Director del SENSOR LAB. CNR- IDASC. Departamento de Física y Química. Universidad de Brescia - Italia

Nowadays the increasing concerns on the effects of pollution on health and of safety stress the need of real-time monitoring of the environment, therefore there is a remarkable effort in terms of research for the development of sensors devoted to several applications [i],[ii],[iii],[iv],[v]. Metal oxide chemical sensors are investigated from more than five decades, their electrical conductivity varies with the composition of the surrounding gas atmosphere. In 1991 Yamazoe showed that reduction of crystallite size went along with a significant increase in gas sensing performances [vi]. Therefore the interesting challenge became the fabrication of materials with small crystallite size which keep their stability over long-term operation at high temperature. In traditional

polycrystalline gas sensors, the high temperature required for the surface reactions to take place induces a grain growth by coalescence and prevents the achievement of very stable materials.
Quasi one-dimensional metal oxide nanostructures have several advantages with respect to their traditional thin- and thick film counterpart such as very large surface-to-volume ratio, dimensions comparable to the extension of surface charge region, superior stability owing to the high crystallinity[vii], relatively simple preparation methods, possible functionalization of their surface with a target specific receptor species[viii], modulation of their operating temperature to select the proper gas semiconductor reactions, catalyst deposition over the surface for promotion or inhibition of specific reactions and finally the possibility of field-effect transistors (FET) configuration that allows the use of gate potential to customize sensitivity and selectivity[ix].
In 2002, the field of semiconductor nanowires underwent a significant expansion and became one of the most active research areas within the nanoscience community[x]. Stimulating advances have been made at an extraordinarily fast rate in different laboratories all over the world following curiosity, discovery or hypothesis driven research.
Nowadays it is almost a decade from the first presentation of metal oxide nanowires as chemical sensors. Significant advances have been made both in terms of preparation procedures and their integration into functional sensing devices, while progress in fundamental understanding of their functional properties is slowmoving. In fact, the full integration still remains a challenge that has been wisely approached in different ways. The most recent developments in bottom up and top down approaches for chemical sensors and advanced applications will be presented.
In the last decade Electronic Noses (ENs) have gained a noteworthy interest as monitoring tools in evaluating food quality and safety.
Since most food adulterations are reflected on volatile chemical profile, these systems can find many applications such as process monitoring, freshness evaluation, shelf-life investigation, sensory and authenticity assessment, microbial contamination diagnosis, providing for rapid and objective analysis. In particular, natural microbial contamination can both pose a serious threat on customers health and heavily damage the producers business. Availability of reliable tools to perform early diagnoses is still an open issue in the field.
Recent studies conducted in our laboratory have demonstrated the noteworthy skill of ENs in performing fast and trustful identification of spoiled beverages (fruit juices, soft drinks and coffee). Moreover, preliminary measurements demonstrated that nanowire-based sensors can be favourably implemented in the electronic nose and that they perform comparably with the conventional thin-film layers.
The results regarding preparation, structural characterization and integration in electronic noses for food and security applications will be presented.

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16:30hs Mesa redonda.

Tiene por objetivo discutir los próximos desafíos de la vinculación entre Argentina e Italia, en la articulación de sus capacidades científico tecnológicas en micro y nanotecnologías.

17:00 hs Clausura