ΙΤΕ/ΕΙΧΗΜΥΘ

ΣΕΜΙΝΑΡΙΟ

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ΟΜΙΛΗΤΗΣ: **Carmen Mijangos, Research Professor**
Instituto de Ciencia y Tecnologia de Polímeros, CSIC
Juan de la Cierva 3, Madrid, 28006, SPAIN

ΘΕΜΑ: **One dimensional polymer nanostructures. From confinement to potential applications.**

ΤΟΠΟΣ: Αίθουσα Σεμιναρίων ΙΤΕ/ΕΙΧΗΜΥΘ

ΗΜΕΡΟΜΗΝΙΑ: **Τετάρτη, 15 Σεπτεμβρίου 2010**

ΩΡΑ: **12:00**

ΠΕΡΙΛΗΨΗ:

The search of new polymer nanostructures with different aspect ratios is one of the most dynamic scientific field in the general area of materials. An idea of their importance can be directly extracted from the "White Book on Polymer Nanoscience and Nanotechnology, a European Perspective"(1) or from "Nanostructured Polymers and Nanocomposites" abstracts book (2). At the present, there are two main trends in polymer nanotechnology studies, one concerns the ability to fabricate tailored and functionalized polymer nanostructures with nanoscale precision, over a large scale area, and the second is to correlate the polymer properties to the nanoscale polymer dimensions. From the combination of these two concepts, new applications of these functionalised polymer nanomaterials in electronics, photonics, magnetic sensors, biotechnology and other areas, will start to appear very soon.

In connection to polymer nanotechnology, since 2007, to the main research line of our group "New polymer structures by Modification and Gelification", a new objective has been added, that is, to reduce the polymer material dimensions from 3D and 2D to one-dimensional (1D) structure and from macrogel to nanogel structure and to obtain organized and/or hierarchical nanostructures of them. To attain the above goals we have undertaken two actions: the first one is to develop new fabrication methods that allow obtain 1D polymer nanostructures and their ordered arrays by the AAO "template" synthesis. It consists on the infiltration of a given polymer in the porous of an "ordered" porous alumina template. As has been already reported

(3,4), it is the most effective method to prepare 1D polymer-based nanostructures and nanocomposites of a large variety of polymers, with full control over the dimensions. This method is currently developed in our lab for fabricating responsive polymer nanofibers, nanorods, nanotubes and their hierarchical structures.

In this seminaire, we firstly present, the synthesis of alumina "template" and the different polymer inflitration methods to obtain polymer nanofibers, nanorods and nanotubes of very different chemical nature and their nanostructured arrays. We will show that, depending on the type of anodization process and growth regime used, aluminium oxide membranes can be fabricated to contain nanopores in a wide range of diameters, interpores distances and lengths. Some examples of the subsequent polymer infiltration to nanostructure polymers by the precursor film method will be presented. By the same procedure polymer-based nanocomposites functionalised with magnetic and electric nanoparticles have been obtained and the composition distribution determined by confocal Raman microscopy. In both cases, polymer dimensions are adjusted in the nanoscale. Secondly, related to confined polymer properties, it will show how the mobility of the chain is severely restricted and crystallization inhibited.
Few examples on the perspectives to produce miniaturise polymer materials with responsive magnetic, electrical or biocellular interaction, directly related to applications (5-7), will be also presented.

[1] Ed Morphema, ISBN: 978-88-96051-00-9. Sixth Framework Programme, year 2008
[2] Ed PGM, ISBN: 978-84-613-9812-6. 6th International ECNP Conference, Madrid 2010.
[3] J Martín C Mijangos, Langmuir 2009, 25, 1181
[4] J.Maiz,J. Sacristán,C.Mijangos.ChemPhys Letters 484(2010) 290
[5] J Martin, J Maiz, C Mijangos, J Colmenero et al Phys Rev Letter 2010, 104, 19781
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[7] S Grimm, J Martín, J San Roman, C Mijangos and M Steinhart et al, J. Mater. Chem., 2010, 20, 3171–3177

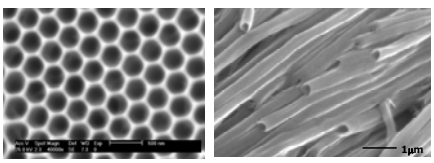

Figure 1. SEM micrographies of AAOO template and PVDF nanotubes.