BASQUE CENTER FOR MATERIALS, APPLICATIONS & NANOSTRUCTURES

ehu group

PhD position (#2/4)

Title: FUNCTIONALIZED SMART SURFACES
Caracter: Experimental

Context

Hybrid organic-inorganic materials have attracted an increasing interest in the past two decades due to the possibility of combining components with different characteristics in a single material to get unusual structures and/or properties that has extraordinary implications in the development of multi-functional materials with novel applications.
Monolayer and multilayer thin films and surfaces of organic, polymeric and/or hybrid materials have gained much attention over the last decades owing to their fundamental importance in understanding material´s properties and their potential applications as smart and/or stimuli-responsive coatings in microelectronics, electro-optics, sensors, nanotechnology, and biotechnology, to mention but a few.
Interpolymer complexes are the result of association of polymers through favorable specific interactions between their chains, obtaining new materials with unprecedented properties by simply mixing two polymer solutions, avoiding the time consuming and tedious synthesis of complicated structures. In this project, we have prepared polymer surfaces, starting from blends of polystyrene and polystyrene-b-polyacrylic acid (PS-b-PAA), an hydrophilic-hydrophobic diblock copolymer. This PAA functionalized polymer surface, is expected to interact with other polymers or chemicals giving rise to new surface properties.

Polyoxometalates (POMs) constitute a large family of anionic metal-oxo clusters that have been regarded as important inorganic building blocks to construct such type of hybrid materials because of their remarkable electronic versatility and structural diversity, which endow them with applications in various areas such as catalysis, reactivity, electronic structure, medicine, or nanotechnology. A plethora of hybrid compounds made of POMs have been described in recent years, so that the current development of POM-based hybrids has focused on the controllability and functionality of these materials.
However, the most interesting and innovative thing, from the point of view of this project, is the possibility of anchoring the inorganic building blocks on functionalized polymeric surfaces through the coordination sphere of one of the metals of the polyoxometalate.
The combination of inorganic and organic compounds in one material has made accessible a vast new area of materials science that has extraordinary implications in the development of multifunctional materials. The polyoxometalates are a family of compounds, with surprising electronic versatility and structural diversity by binding to polymer surfaces, which have different properties giving as a result materials with new applications suitable for use in various fields.

Finally, the use of these active surfaces may have a great interest in the development of new sensors, catalysts or molecular magnets supported in polymer surfaces.

Tasks

In this project we pretend to create organic-inorganic hybrid materials, anchoring different inorganic blocks in a functionalized polymer surfaces. So,this project involves the development of smart polymer surfaces from the formation of inter-polymer complexes wich can be formed or destroyed depending on environmental conditions. The reversibility of the complexation process allows the modification forward and backward on the properties of surfaces, and can be an important step towards the preparation of materials with a dual behavior. Also, we will develop a sensor system for the preparation and complexation of the surface by magnetic interrogation, which has the advantage of not requiring direct connections to other electronic devices.

Requirements

A Master on Materials Science, Polymer Science and Technology or similar is required. Candidates without a Master can also apply, provided they have been accepted into the Master on New Materials of the University of the Basque Country (UPV/EHU).

Application

Send a CV, motivation letter and two references to jobs@bcmaterials.net

Dead line: August 15th, 2012, 24:00 h GMT