ABSTRACT BOOK

4th EuCheMS Chemistry Congress

AUGUST 26–30, 2012, PRAGUE, CZECH REPUBLIC

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P-0709

POLYOXOMETALATE RICH THIN FILMS WITH CONTROLLED STRUCTURE AND FUNCTION FOR DESIGNER ELECTRONICS

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During the last two decades, polyoxometalates (POMs) have attracted growing attention due to their potential application as functional materials potentially enabling new device design and opening new areas of technology. POMs are metal-oxide clusters of early transition metals Mo, W, V, etc with a diverse range of structures and properties, such as reversible electrical capacitance,[1] programmable surface 0D, 2D or 3D structure[2] which could together be of potential application in ultra-high-density data storage,[3, 5] catalysis[4] and also in medicine as antiviral drugs.[5] In the present work, we show that it is possible to assemble structured thin-films by the self-assembly/organization of different POMs (Mo96- and V16-clusters, TRIS-Mn-Anderson and Mn-Dawson types) onto solid supports via electrochemical co-deposition or by preparing multi-planar heterojunction structures with polymers via Langmuir-Schaefer deposition. In the framework of nanoscale organic/hybrid electronics we show here the relationships between the thin film structure and electrochromic or smart dielectric properties.

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Keywords: *Nanotechnolgy; Thin Films; Electrochemistry; Material Science; Self-Assembly;*

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SYNTHESIS OF MONODISPERSE $CUSIO_3$ HIERARCHICAL HOLLOW SPHERES (HHSS) AND THEIR SUBSEQUENT CONVERSION TO CU_3N/SIO_2 AND CUS/SIO_2 HYBRID HHSS

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Monodisperse hollow spheres are of great interest due to their characteristic shape, well-controlled size, high surface area and large void space, which makes them potential candidate for various technological applications. Inorganic silica-based composite materials having structural features in the nanometer regime are an important class of hybrid materials. The chemical inertness, high temperature stability and biocompatibility are important features of silica which makes them ideal constituent of nanocomposites. Exploring new morphologies of metal nitride and metal sulphide based nanomaterials, may deliver new or improved physical and chemical properties to meet the demands of future advanced functional materials.

$CuSiO_3$ HHSs were synthesized under hydrothermal conditions using monodispersed Stöber silica spheres as a chemical template[1]. A subsequent thermal treatment under ammonia atmosphere allowed formation of Cu_3N/SiO_2 hybrid HHSs. Furthermore, room temperature sulphidation reaction of $CuSiO_3{\cdot}H_2O$ HHSs with aqueous $(NH_4)_2S$ gave CuS/SiO_2 hybrid HHSs. The Cu_3N/SiO_2 and CuS/SiO_2 hybrid HHSs were characterized by X-ray diffraction, transmission electron microscopy and energy-dispersive X-ray spectroscopy analysis. The morphology of $CuSiO_3{\cdot}H_2O$ HHSs is well kept after nitridation and sulphidation reactions. The use of Stöber silica spheres as a chemical template appears to be a simple way to accomplish synthesis of monodisperse Cu_3N/SiO_2 and CuS/SiO_2 hybrid HHSs.

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Keywords: *Nanostructures; Silicates; Nitrides;*