

Influence of Nanostructure on Properties of Organic-Inorganic Hybrid Materials of Technological Interest

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The preparation, characterization and applications of organic/inorganic hybrid materials have become a fast expanding area of research in materials science [1-3]. The major driving force behind the intense activities in this area are the new and different properties of the nanocomposites which the traditional macroscale composites do not have. Unlike the traditional composites materials which have macroscale domain size of millimeter or micrometer scale, most of the organic/inorganic materials are nanoscopic, with the physical constraint of several nanometers, typically 1-100 nm as the minimum size of the components or phase. Therefore, they are often still optically transparent materials although microphase separation may exist. Through the combinations of different inorganic and organic components in conjunction with appropriate processing methods, various types of primary and secondary bonding can be developed leading to materials with new properties. In this presentation we show how the nanostructural features of different types of organic-inorganic hybrids are determinant for the properties of these materials [4]. The nanoscopic structure of hybrids prepared by Sol-Gel method and presenting ionic or electronic conductivity, magnetic properties, high mechanical or adhesion properties, biological or optical interest has been investigated by Small-Angle X-ray scattering (SAXS) and results evidence that, much more than optimizing the local or individual properties of each phase of the materials, the control of nanostructure is the key to improve the applicability of such nanocomposites. In this sense, some examples of possible technological applications of each hybrid family are presented and future improvements proposed.

Keywords: Hybrids, Sol-Gel, Nanocomposites, SAXS

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[1] J. Wen, G.L Wilkes, *Chem. Mater.* (1996) 8: 1667.

[2] C. Sanchez, B. Julián, P. Belleville, M. Popall, *J. Mat. Chem.* (2005) 15: 3557

[3] C. Sanchez, G.J.A.A Soler-Illia, F. Ribot, D. Grosso, *C.R Chimie* (2003) 6: 1131

[4] All papers from K. Dahmouche available online

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