SYNTHESIS OF NANOSTRUCTURED ZnO-GRAPHENE COMPOSITE

Germán Pérez Zúñiga\textsuperscript{1}, Gabriel Herrera Pérez\textsuperscript{2}, Mario Miki Yoshida\textsuperscript{3}, Ysmael Verde Gomez\textsuperscript{1}, Ana María Valenzuela Muñiz\textsuperscript{4}

\textsuperscript{1}Instituto Tecnológico de Cancún, Doctorado en Ciencia en Materiales, Mexico. \textsuperscript{2}Instituto Tecnológico Superior de Irapuato, Departamento de Ingeniería en Materiales, Mexico. \textsuperscript{3}Centro de Investigación en Materiales Avanzados, S.C., Centro de Investigación en Materiales Avanzados (CIMAV), Mexico. \textsuperscript{4}Instituto Tecnológico de Cancún, Catedrática CONACYT - Instituto Tecnológico de Cancún, Mexico.

The synthesis of ZnO-Graphene composite is presented in this work; the addition of ZnO particles on Graphene could improve the Li-ion retention capacity, when it is used as anode in Li ion batteries. The proposed methodology allows an easy control over the structural characteristics of the materials. The synthesis of the material ZnO-GR was carried out combining Graphene oxide (GO) and Wulfingite phase (Zn(OH)\textsubscript{2}) at hydrothermal conditions to obtain a nanostructured composite. Particles of Zn(OH)\textsubscript{2}, with controlled crystallite sized were anchored uniformly to the graphene reduced (GR) sheets. Structural characterization was carried out with Raman spectroscopy and X ray diffraction. First, the GO was obtained using the modified Hummers method and according to the Rietveld refinement analysis and Raman spectroscopy, the thickness was determined around 5 sheets. The synthesis of Wulfingite, was carried out by chemical precipitation, exploring different post-synthesis crystallization time to control the crystallite size. Rietveld refinement results shows approximately sizes around 170 nm with octahedral morphology. Afterwards, the particles were anchored to the GO sheets under hydrothermal conditions, changing the content of Wulfingite. Subsequently, the material obtained was subjected to heat treatment at 300 °C, in order to reduce the GO to GR, simultaneously; the Wulfingite is transformed to Wurtzite (ZnO). In the process of phase transformation, the crystallite size is reduced to ~30 nm as well as the particle size. Thus the ZnO-GR nanostructured composite was obtained. Hence, by controlling the crystallite size the particles growth can be avoided keeping the particles in nanometer size, facilitating the anchorage to the GR sheets. The analysis of the obtained results will be presented at the conference.

Keywords: Nanostructured materials, ZnO-Graphene, Rietveld analysis

Presenting author’s email: gemmano@hotmail.com