Synthesis and magnetic properties of nanostructured metallic Co, Mn and Ni oxide materials obtained from solid-state metal-macromolecular complex precursors

Díaz C.

Valenzuela M.L.

Laguna-Bercero M.A.

Orera A.

Bobadilla D.

Abarca S.

Peña O.

The simple reaction of chitosan with metallic salts yields (chitosan) (MLn)x, MLn = MnCl2, CoCl2, NiCl2, macromolecular complexes which, after a thermal treatment at 800 °C under air, give nanostructured Mn2O3, Co3O4 and NiO. The polymer acts as a template in the solid state, which is eliminated after the combustion process. At an intermediate stage, a layered graphitic carbon matrix was observed by HRTEM over the grown metal oxides. A mechanism for the growth of nanostructured oxides is discussed, including Raman studies. The nanostructured Mn2O3, Co3O4 and NiO particles grow over graphite layers and the solid-state role of chitosan is crucial for the formation of this graphite substrate. An antiferromagnetic transition was observed in Co3O4 nanoparticles, with TN = 38 K, whereas NiO nanoparticles behave as a superparamagnetic material with a blocking temperature above 300 K.