Nickel nanocomposites: magnetic and catalytic properties

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Resumen

In this study, we are reporting the synthesis and characterization of nanocomposites obtained from the direct reduction of nickel(II) salts on matrices of polyethylene (Pe) and chitosan (Ch) in the presence of serine under solvothermal conditions. Using different molar ratios between the metal salt (M) and the amino acid (AA), eight nanocomposites were prepared, Ni-Pe1; Ni-Pe2; Ni-Pe3; Ni-Pe4 and Ni-Ch1; Ni-Ch2; Ni-Ch3; Ni-Ch4 (M : AA = 1 : 1, (1); 0.5 : 1, (2); 0.25 : 1, (3) and 0.125 : 1, (4)). The synthesized composites were characterized by X-ray powder diffraction techniques; in all the cases, the peaks associated to the matrix (Pe or Ch) and three peaks at 2 theta values of 44.5 degrees, 51.9 degrees, 76.4 degrees were identified, which correspond to the Miller indices (111), (200), (220). These indices are characteristic of a face centred cubic Ni-0 phase. The SEM images of the composites show that the use of an organic matrix changes the size and distribution of the metallic particles because in all the cases a homogenous dispersion of Ni-0-NPs on the matrix surfaces is observed. While the spherical shape observed for isolated Ni-0-NPs is retained on the matrices, the size of the metallic particles is smaller than 100 nm with less size variability, as compared with the isolated Ni-0-NPs. All the composites have a weak ferromagnetic behaviour with similar hysteresis loops, presenting H-c values ranging from 120 to 226 Oe and reaching saturation at approximately 3 kOe. Preliminary catalytic properties for hydrogen transfer reaction were also investigated, showing that the composites exhibit an important activity in the transformation of acetophenone to 1-phenylethanol.

Palabras clave

KeyWords Plus:HYDROGEN-TRANSFER REDUCTION; CARBONYL-COMPOUNDS;NANOPARTICLES; NANOCATALYSTS; DEPOSITION; PARTICLES; BEHAVIOR; ARRAY; GOLD

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