Journal of Alloys and Compounds

Volume 643, Issue S1, 14 June 2015, Pages S209-S218

Microwave-assisted hydrothermal synthesis of CePO4 nanostructures: Correlation between the structural and optical properties (Article)

Palma-Ramírez, D.[a], Domínguez-Crespo, M.A.[a], Torres-Huerta, A.M.[a], Dorantes-Rosales, H.[b], Ramírez-Meneses, E.[c], Rodríguez, E.[a]

[a] Instituto Politécnico Nacional, **CICATA**-Unidad **Altamira**, Carretera Tampico-Puerto Industrial **Altamira**, Km 14.5, Altamira, Tamps, Mexico

[b] Instituto Politécnico Nacional, ESIQIE, Departamento de Metalurgia, México D.F., Mexico

[c] Universidad Iberoamericana, Departamento de Ingeniería y Ciencias Químicas, Lomas de Santa Fe, Prolongación Paseo de la Reforma 880, México D.F., Mexico

Abstract

In this work, the microwave-assisted hydrothermal method is proposed as an alternative to the synthesis of cerium phosphate (CePO4) nanostructures to evaluate the influence of different synthesis parameters on both the structural and optical properties. In order to reach this goal, two different sets of experiments were designed, varying the reaction temperature (130 and 180°C), synthesis time (15 and 30 min) and sintering temperature (400 and 600°C), maintaining a constant pH = 3. Thereafter, two experimental conditions were selected to assess changes in the properties of CePO4 nanopowders with pH (1, 5, 9 and 11). The crystal structure and morphology of the nanostructures were characterized by X-ray diffraction (XRD), transmission electron microscopy (TEM) and scanning electron microscopy (SEM), respectively. Diffuse reflectance properties of CePO4 with different microstructures were studied. The results demonstrated that by using the microwave-assisted hydrothermal method, the shape, size and structural phase of CePO4 can be modulated by using relatively low synthesis temperatures and short reaction times, and depending on pH, a sintering process is not needed to obtain either a desired phase or size. Under the selected experimental conditions, the materials underwent an evolution from nanorods to semispherical nanoparticles, accompanied by a phase transition from hexagonal to monoclinic.

Author keywords

CePO4; Microwave-assisted hydrothermal method; Nanostructures