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Synthesis of NixMg1-xO nano particles solid solution by sol-gel self combustion method and investigation of its structural and optical properties

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Abstract

In this paper, the NixMg1-x O ($0.1 \leq x \leq 0.4$) solid solution nano-powder was synthesized by new and soft non-alkoxide sol-gel self-combustion method. In this method, Ni(NO3)3·6H2O, Mg(CH3COO)2·4H2O and Citric acid (CA), were used as Ni2+, Mg2+ ion and gelling and combusting source, respectively. Then, by thermal gravimetric analysis (TGA) the chemical reaction and the appropriate temperature to form a stable compound were determined. The influences of molar ratio of component (x) on structural and optical properties of samples have been investigated by X-ray diffraction (XRD), field-emission scanning electron microscope (FESEM), diffuse reflectance spectroscopy (DRS), photoluminescence (PL), and Fourier transform infrared (FTIR) analysis. By increasing in x, all the samples are shown decreasing ecreasing in lattice parameter (a) and crystallite size (D), which indicates the contamination of magnesium oxide with nickel and the formation of NixMg1-xO solid solution. The Band gap was decreased by increasing in x which shows that Ni2+ ions in MgO structure causes some modifications in the energy levels and the optical absorbance characteristics associated with F centers due to oxygen defect centers.

Keywords: NixMg1-xO Solid solution, nano particles, self-combustion sol gel, optical properties, band structure

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