Sol-Gel Derived Lanthanide-Substituted Layered Double Hydroxides $Mg_3/Al_{1-x}Ln_x$

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Recently, considerable attention has been focused on incorporating rare earth ions into LDHs hosts to develop new functional materials, which resemble designed optical properties [1]. LDHs doped with Tb^{3+} ions in the brucite-like layers were prepared by a simple one-step co-precipitation method [2, 3]. Nanosized LDHs doped with Eu^{3+}, Yb^{3+}, Tb^{3+} and Nd^{3+} were prepared through the microemulsion method [4]. The Eu^{3+} and Nd^{3+} were incorporated also into hydrocalumite and mayenite [5]. The Zn/Al/Eu and Zn/Al/Dy LDHs were also reported as perspective and efficient luminescent materials [6-8]. Cerium-doped hydrotalcite-like precursors were also recently synthesized by co-precipitation method [9].

The main aim of this study was to investigate Nd^{3+}, Sm^{3+} and Eu^{3+} substitution effects in the $Mg/Al_{1-x}Ln_x$ systems (the Ln^{3+} concentration in the crystal lattice was changed from 0.05 to 10 mol%) fabricated for the first time to the best our knowledge by sol-gel synthesis route.

The $Mg_3/Al_{1-x}Ln_x$ LDH samples were synthesised by sol-gel method from the solution of metal nitrates, dissolved in 50 ml of distilled water. Secondly, 0.2 M citric acid was added and obtained solution was stirred for 1 h at 80 °C. Next, 2 ml of ethylene glycol have been added to the resulted mixture with continues stirring at 150 °C until the complete evaporation of solvent. The obtained gel was dried at 105 °C for 24 h. The mixed metal oxides were obtained by heating the gels at 650 °C for 4 h. The $Mg_3/Al_{1-x}Ln_x$ LDH specimens were obtained by reconstruction of MMO powders in water at 50 °C for 6 h under stirring. The samples obtained were characterized by X-ray diffraction (XRD) analysis, Fourier Transform Infrared spectroscopy (FT-IR), thermogravimetric (TG) analysis and scanning electron microscopy (SEM). The luminescent properties of $Mg_3/Al_{1-x}Ln_x$ LDH samples were also investigated. The results revealed that lanthanide element enters into a hydrotalcite structure containing Mg^{2+} and Al^{3+} cations in the brucite-like layers.

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