

Preparation and characterization of ZrO₂:Sm amorphous thin films by solid state photochemical deposition method

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Abstract

Thin films of ZrO₂ loaded with 10, 30 and 50 mol% Sm were prepared by a photochemical method using thin films of metal acetylacetonate complexes as precursors. The photolysis of these films induces the fragmentation of the acetylacetonate ligand and the partial reduction of metal ion together with volatile organic compounds. When the metallic complex is exposed to air, the product of the reaction is metal oxide. The photoreactivity of these films was monitored by FT-IR spectroscopy, followed by a post-annealing treatment process. The obtained films were characterized by X-ray photoelectron spectroscopy and atomic force microscopy. Photoluminescence studies of the films employed 400 nm radiation for excitation of the Sm ions present. The emission spectra showed signals arising from the 4G_{5/2}→6H_J (J=3/2, 7/2, 9/2) transitions, where the 4G_{5/2}→6H_{3/2} transition has the highest intensity. The concentration dependence of the PL intensity was also studied. A maximum PL intensity was observed with 10 mol% Sm content but then diminished with higher Sm concentrations.

Keywords

A. Amorphous materials, A. Thin films, C. Photoelectron spectroscopy, D. Luminescence.