

A simple photochemical method to synthesize Ga₂O₃Dy₃M₃ thin films and their evaluation as optical materials (where M=Cr or Co)

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We report the photochemical method to synthesize Ga₂O₃Dy₃Co₃ and Ga₂O₃Dy₃Cr₃ thin films. X-ray photoelectron spectroscopy, X-ray diffraction and photoluminescence were used to characterize the products. These analyses revealed that as-deposited and annealed films are amorphous. The optical characterization of the films showed that these are highly transparent in the visible spectrum but decrease significantly with doped and co-doped films. Under the excitation of UV light (254 nm) the doped films (Ga₂O₃Dy₃) show the characteristic emissions of Dy³⁺ at 500, 575, 594, 605 and 652 nm corresponding to $4F_{9/2} \rightarrow 6H_J$ (J=15/2, 13/2 and 11/2) transitions but the emissions decrease with the co-doped films (Ga₂O₃Dy₃M₃, where M=Cr or Co); a possible emission mechanism and energy transfer have been proposed. © 2011 Elsevier Ltd.