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Physical study of Eu doped MoO_3 thin films

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Abstract:

This work highlights some physical properties on Eu-doped MoO_3 thin films produced by spray pyrolysis. In practice an aqueous solution of ammonium Molybdate containing various concentration of Europium (0-2%) is sprayed on a glass substrate heated at 460°C in air. X-ray diffraction (XRD) and Raman spectroscopy showed that all the produced films crystallized in the orthorhombic α-MoO_3 like structure. Parallel to these structural studies, the X-ray Photoelectron Spectroscopy (XPS) spectra of the doped films were recorded and compared to that of their MoO_3 parent. All exhibited the signature of Mo^{6+} and O^{2-} species related to MoO_3 phase while only the doped ones evidenced the signal of Eu^{3+} with a binding energy close to that Eu_2O_3 oxide. Scanning Electron Microscopy evidenced a dense coral-like surface morphology suggesting the formation of juxtaposed and superposed differently sized plates during the film growth. The optical properties of the films were also investigated. Transmission and reflection measurements were typically performed. They showed a transmission coefficient decrease when Eu doping increased (40-75%), making them more valuable for gas sensing application based on opto-electronic properties changes. Finally, these doped films having large specific surfaces may be of interest for possible sensitivity applications such as photocatalysis, gas sensors.

Keywords: MoO_3, Eu doped thin films, Spray pyrolysis, XRD analysis, Raman and XPS spectroscopies, Optical properties, photocatalyse test.