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Luminescent thin films prepared by combined reactive magnetron sputtering and plasma decomposition of non-volatile precursorsFrancisco Yubero¹, Jorge Gil Rostra², Agustín R. González-Elipe³¹ICMS (CSIC - U. Sevilla), Sevilla, Spain ²ICMSE (CSIC - U. Sevilla), Sevilla, Spain ³ICMSE (CSIC U. Sevilla), Sevilla, Spain

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This paper reports on a new procedure of preparation of mixed oxide thin films that combines the traditional reactive magnetron sputtering (MS) deposition of one of the oxide components with the plasma activated decomposition of non-volatile precursors at room temperature. It allows obtaining in a well-controlled manner mixed oxide thin films with a precise control of their composition (1). The procedure consists of using the plasma activated by the magnetron discharge to decompose a metal-organic compound sublimated by means of an effusion cell within the deposition chamber. The characteristics of the deposited films are controlled by a proper adjustment of process parameters such as the magnetron discharge power, the chemistry of the non-volatile metal-organic precursor, and the relative deposition rates of the matrix oxide by MS and the cation supplied by the effusion cell. In this presentation the capabilities of this new experimental procedure are shown with the preparation of luminescent thin films consisting of rare earth (RE) cations (Tb^{3+} , Eu^{3+} , ...) incorporated as minority elements in an oxide matrix (TiO_2 , SiO_2 , ZnO). In these preparations, the oxide matrix was supplied by reactive MS from Ti, Si or Zn targets, while the RE cation was dosed by sublimation of acetylacetonate compounds. The obtained mixed oxide thin films have been characterized by different methods and their luminescent properties studied as a function of RE element present in the film. The possibilities of the procedure for the synthesis of other mixed oxide thin films containing alkaline, alkaline-earth, RE or other reactive metal cations (e.g., solid electrolytes, battery electrodes, mixed conductors, etc.) are discussed.

(1) J. Gil-Rostra, F. Yubero, A. Barranco, A.R. González-Elipe. Procedimiento para la preparación de películas delgadas de óxidos mixtos sobre sustratos y dispositivo para su realización. Spanish patent P201230048. Presented 13 January 2012,

Keywords

luminescence
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mixed oxide thin films
magnetron sputtering