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Electrical and optical properties of delafossite structure AgCrO₂ and CuCrO₂ reactively co sputter deposited coatingsAlain Billard¹, Mohammad Arab Pour Yazdi¹, Jean Francois Pierson²¹LERMPS-UTBM, Belfort, France ²IJL, Nancy, France

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Transparent conducting oxides (TCOs) are materials with rather high electronic conductivity and low optical absorption of the visible light which can be used in many applications in transparent electronics, e.g. light emitting diodes, photovoltaics, smart windows or flat panel displays. The p-type TCOs mainly consist in spinel and delafossite materials with AB₂O₄ and ABO₂ stoichiometry, respectively. Very few papers deal with the deposition of delafossite structure coatings which however are of strong importance for the development of new transparent devices which are not feasible with n-type materials alone, e.g. transparent diodes, transistors or heterojunctions.

In this paper, we investigate the feasibility of p-type delafossite structure AgCrO₂ and CuCrO₂ coatings by co sputtering of metallic targets in argon-oxygen reactive gas mixtures.

After a short description of the experimental device where the substrates are positioned on a rotating substrate holder, the coatings are performed in so called compound sputtering mode by fixing the discharge current of the Cr target and by modifying that of the Cu or Ag one. Hence, the chemical, structural, microstructural and morphological features of the coatings are investigated via scanning electronic energy dispersive X-ray spectroscopy, X-ray diffraction and scanning electron microscopy on thick films.

Complementary structural data are assessed by Fourier transmission infrared spectroscopy and Raman spectrometry. The optical properties of the films are assessed by optical transmission spectrophotometry and their electrical conductivity is determined by using four point probe method. Finally, the influence of annealing performed in air at different temperatures is investigated owing to the structural, optical and electrical properties of both AgCrO₂ and CuCrO₂ coatings.

Keywords

delafossite

CuCrO₂AgCrO₂

optical properties

electronic conductivity