

Effect of deposition time on the properties of Cu₂O thin film electrodeposited on ITO substrates

S. Laidoudi, M.R. Khelladi, C. Dehchar, L. Lamiri, R. Yekhlef, S. Boudour, R. Boufnik

Abstract : In the last few years, the scientists have researched for a sustainable, inexpensive, and efficient new materials for enhancing electrocatalytic activity and electronic energy conversion. All explored materials have provided novel and high electrical, electrochemical, magnetic and optical characteristics. Among them, Cuprous oxide (Cu₂O) thin films grown by electrodeposition clearly fulfill the sustainability and the cost pre-requisites. Therefore, if they are well prepared and electrodeposited they could lead to the fabrication of highly efficient devices. In this study, we investigate the effect of deposition time on the electrochemical, structural, morphological and optical properties of Cu₂O thin films. The Cu₂O thin films were electrochemically elaborated on ITO substrate into a reducing sulphatic bath under pH 11 by a chronoamperometric method at a potential of 0.50V versus SCE. Deposition time was varied from 1 to 10 min. The XRD analysis indicated that the synthesized Cu₂O thin films had a cubic phase with a preferred texture along (111) plane. In addition, no trace of CuO and Cu was observed. From AFM analysis, the thickness and the roughness of the thin films increase by increasing deposition time from 1 to 10 min. The surface of the deposits was become dense and compact when the deposition time increase. The optical properties of the as-deposited Cu₂O thin films revealed an optical transmission of about 70% in visible light region. The optical energy band gap was estimated from Tauc extrapolation; it was found that the band gap of Cu₂O thin films is 1.9-2.2 eV. A summary, the obtained Cu₂O thin films have suitable and high properties. Therefore, they could be a good candidate to develop advanced electrode materials for solar cells, electrochemical sensors and electrocatalytic purposes.

Keywords : Cu₂O thin film, deposition time, electrodeposition