

OPTICAL, STRUCTURAL AND MORPHOLOGICAL CHARACTERIZATION OF ELECTRODEPOSITED CUPROUS OXIDE THIN FILMS: EFFECT OF DEPOSITION TIME

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Abstract : The purpose of this work is the development and characterization of a novel electrode material based on copper oxide (Cu_2O) for use as electrode in catalytic application. The samples are prepared on an indium doped tin oxide (ITO) glass substrate using a simple electrochemical deposition process from a solution of copper (II) sulfate and citric acid. The Cu_2O films are deposited under chronoamperometric control at a potential of 0.50V versus SCE at different deposition times ranging from 2 to 15 minutes. The solution was maintained at a temperature of 60°C and a pH of 11. The effect of the deposition time is mainly examined in terms of the change in structural, morphological and optical properties of the Cu_2O films using various characterization techniques. Atomic force microscopy (AFM) images showed that the prepared thin films are homogeneous with a granular shape. Also, the surface of the deposits becomes roughened with increasing deposition time. Scanning electron microscopy (SEM) images showed that the morphology of the prepared thin films is composed of a mixture of cubic and pyramidal shapes regularly distributed over the surface of the substrate. X-ray diffraction (XRD) measurements demonstrated that Cu_2O thin films prepared by electrochemical deposition have a pure cubic structure with higher preferred growth orientation (111) and good crystallinity. Characterization by UV-Visible spectroscopy showed that the samples have high absorption in the visible region. The calculated values of the direct band gap are between 1.9 and 2.15 eV. These results represent a good starting point for the development of low cost anode used in catalytic application.

Keywords : Cu_2O thin film, electrodeposition, deposition time, optical properties