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Electrodeposition of copper oxides (Cu_xO_y) from acetate bath

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Abstract

Herein, we report the study of the electrodeposition of copper oxides mainly Cuprite (Cu_2O), paramelaconite Cu_4O_3 and tenorite (CuO) from a slightly acidic Cu(II) acetate solution on indium-doped tin oxide (ITO) substrate. A formation mechanism was proposed based on the observation of a series of reaction intermediates. The potential domain where the electrodeposition of copper oxides (Cu_xO_y) is possible was investigated. The nucleation mechanism of (Cu_2O) during electrodeposition was studied as a function of Cu^{2+} concentrations and deposition potential by exploiting the electrochemical techniques such as cyclic voltammetry and chronoamperometry. This study enabled us to demonstrate that the nucleation process and the growth of dendrites obey the model of Scharifker and Hills 3D instantaneous under diffusion control. Morphological and structural characterizations of the electrodeposit are performed by scanning electron microscopy (SEM) and X-ray diffraction (XRD).

Keywords: copper oxides; paramelaconite; cuprite; ITO substrate; electrodeposition; nucleation model.

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