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Electrodeposition of Cu2O and effect of different deposition parameters on its properties

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This work demonstrates the influence of bath pH, deposition voltage, time of deposition and temperature of the system on the morphological and optical properties of electrodeposited Cu2O thin films. CU2O thin films were electrodeposited on FTO substrates in copper sulphate solution. For each sample, the potential intervals were established from cyclic voltammetric studies. All the films obtained showed p-type conductivity, which were analysed from Mott-Schottky plots. The acceptor density were estimated to be in the range from 2 x 1018 cm-3 to 4 x 1018 cm-3. SEM micrographs showed that with increase in bath pH, grain size of thin films grew larger, which in turn resulted into better optical absorption, as was analysed under the UV – Vis studies. The range of absorption spectrum in all samples was between 2.1 to 2.28 eV. All the XRD peaks showed that the films were highly crystalline in nature, and possessing the desirable phase (110). With the increase in time of deposition, the deposited thicknesses of films varied from 200 nm to 4 μ corresponding to t = 15 minutes to t = 2 hours respectively. It was concluded that while the deposition potential and pH have strong influence on the grain size and crystallite shapes of films, their influence on the optical band gap and on acceptor density was not significant. The time of deposition and the temperature of system have a great role in the film thicknesses.