

# Effect of pH on the properties of electrodeposited Cuprous Oxide nanostructures

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## Abstract

Cuprous oxide (Cu<sub>2</sub>O) is a well-known oxide semiconductor with a band gap of 2.1 eV and a natural p-type conductivity, which is an attractive material for device applications because of its abundant availability, non toxicity, and low production cost. It has been explored in junction with n type ZnO for photovoltaic applications [1]. Moreover, the conduction type can be changed from p to n by controlling the pH of the deposition solutions [2]. Cu<sub>2</sub>O nanostructures have been made by a variety of techniques; the electrodeposition method has emerged as one of the most promising processing routes as it is particularly provides advantages such as a low-cost, low temperature and a high level of purity in the products [3].

In this work, n-type Cu<sub>2</sub>O thin films are deposited on F-doped SnO<sub>2</sub> (FTO) by electrodeposition process at 60 °C, the solution pH was adjusted in the range of 5 to 6,5 by the addition of sodium hydroxide. Cyclic voltammetry and chronoamperometry are used to investigate the growth mechanisms. Mott-Schottky analysis (M-S), X-ray diffraction (XRD) and atomic force microscopy (AFM) are used to characterize these films. M-S plots indicate that the Cu<sub>2</sub>O nanostructures are n-type semiconductor. The flat-band potential and the carrier concentration were found to decrease when the pH increases. XRD studies reveal that the nanostructure are polycrystalline with cubic structure, exhibit preferential orientation along a (111) plane.

**Keywords:** Cuprous oxide, electrodeposition, n-type, nanostructures, Mott-schottky.

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