Effect of ph on the properties of electrodeposited Coprous Oxide nanostructures

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Abstract

Cuprous oxide (Cu_2O) 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_2O 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_2O thin films are deposited on F-doped SnO_2 (FTO) by electrodeposition process at 60 ^oC, the solution pH was adjusted in the range of 5 to 6,5 by the addition of sodium hydroxide. Cyclic voltammetry and chronoamperommetry 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_2O 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.

References:

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