ABSTRACT

A low cost and simple chemical method based on boiling copper plates in copper plates in $CuSO_4$ solution is used to prepare Cu_2O layers on Cu substrates. X-ray diffraction (XRD), Scanning electron Microscopy (SEM), X-ray Photoelectron Spectroscopy (XPS), Glow Discharge Optical Emission Spectroscopy (GDOES) and Optical Absorption have been used to characterize these layers. It has been found that the layers consist of Cu_2O phase with a thickness of about 1.4 μm when the Cu plate is boiled in $CuSO_4$ solution for 60 minutes. The largest grain sizes are in the order of 1 μm and the layers contain cubic Cu_2O phases. The layers are n-type in electrical condition and the optical band gap observed is 2.2 eV.

n-Cu_2O films were prepared by boiling well cleaned copper plates in a (10^{-3} M) $CuSO_4$ solution at different boiling periods, to obtain copper oxide films with nanocrystals and microcrystals films on the copper substrate. The resulting films were characterized by SEM and XRD measurements. p-type merocyanine dye films were deposited on n- Cu_2O films to make a n-p junction. A photocurrent enhancement was observed in case of the nanocrystals n-Cu_2O/ p-merocyanine photoelectrode at the electrolyte (10^{-4} M) (Fe^{2+}/Fe^{3+} redox couple was used at the electrolyte) interface due to the enhanced light absorption properties of the dye and the efficient charge separation at the n-p junction. Mechanisms involved for the photocurrent enhancement are discussed in detail.