

E1-14 A simple photoelectrochemical cell

C A N Fernando, S K Wetthasingha
Dept of Physics, University of Ruhuna, Matara

Making cuprous oxide (Cu_2O) thin films is attractive since they can be produced at relatively low cost. These thin films can be produced by using various methods, such as thermally, sputtering and chemically. Most of the films prepared showed p-type semiconductor properties and, currently, n-type photoresponses from cuprous oxide is under investigation. This work presents an extremely simple preparation method of making cuprous oxide thin films showing n-type photoresponses and a simple technique to dope iodine into the material. A well-cleaned copper plate (2x4cm) is immersed in a copper sulphate solution (0.005M) for 2 days. XRD measurements show the formed material is pure cuprous oxide. Formation of CuO is non-significant in the material prepared from copper sulphate solution. Photocurrent action spectra is analogous with diffuse reflectance spectra of the prepared material. Impurity absorption bands are not observed in the diffuse reflectance spectra and the photocurrent action spectra in KI (10^{-2}M)+ I_2 (10^{-4}M) solution. Photocurrent action spectra are changed, if the sample is dipped in CuSO_4 solution with 24 h durations, after each duration photoresponses are measured using a potentiostat, giving a biased potential (-0.25V vs SCE) in KI+ I_2 solution. After observing the photocurrent, again, the photocathode is immersed into the previous CuSO_4 solution for another 24 h duration. This procedure is done stepwise. Because of this procedure, a new photocurrent peak appears at $\lambda = 580$ nm in the photocurrent spectrum. Peak height is increased and saturated, at the same time it is seen, the band to band transition is decreased due to the trapping of electrons from impurity levels of iodine. The cost of making the photoelectrode is negligible when compared to that of other photoelectrodes presently available.

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