E2-39: A simple technique to obtain cuprous oxide hexagonal crystallites for solar energy conversion devices

C A N Fernando[1] T M W J Bandara[1] R M Mehra[2] N C Mehra[2] P C Mathur[2] S Shuckla[2]
([1] *Dept of Physics, University of Ruhuna, Matara,* [2] *University of New Delhi, India*)

Cuprous oxide is an attractive material since it can be prepared at relatively low cost as a solar energy conversion device. p-type Cu_2O can be prepared by heating a copper plate in air (800°C for 5 min). Scanning electron micrograph (SEM) pictures show cracks with the small crystallites on the surface for the p-type cuprous oxide prepared by heating. This investigation describes a simple method to obtain very large hexagonal crystallites of Cu_2O and the effect on photocurrent measurements in the photoelectrochemical medium.

At first thermally prepared p-Cu_2O on copper substrates are quenched with $CuSO_4$ (10^{-3} M) immediately after removing from the oven. p-Cu_2O plates are kept immersed in the $CuSO_4$ solution in order to obtain the hexagonal crystallites

on the surface of p-Cu_2O prepared by heating. SEM pictures show, with the immersion lengths of the samples, initially the size of the crystallites increased rapidly and reached a constant size. Diffuse reflectance spectra red shifts with the size of these hexagonal crystallites. Photocurrent improvements can be observed when the size of the crystallites are increased. For the samples prepared for long duration immersion lengths (5 days), photocurrent decreases due to trapping of photogenerated carriers with surface states formed on the surface.

This method is useful when it is needed to make a very thick layer of Cu_2O in making devices. Stable thin film, can be obtained from this method in order to make photoelectrochemical cells. XRD data confirm that the formed material is entirely Cu_2O.

Financial assistance from NARESA, Ruhuna University Research Fund, UGC Hiran Thilakarathna Research Fund, Centre for Theoretical Physics Italy and University of New Delhi are acknowledged.