E1-08: A study of photoluminescence measurements and scanning electron micrograph of n-Cu_2O photoelecrodes

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Recently, n-Cu_2O photoelectrodes have become of great interest for making solar cells at low cost. The preparation of n-Cu_2O photoelectrodes is extremely simple. Clean copper plates are immersed in $CuSO_4$ (10^{-3} M) solution for 2 days in order to obtain a quality n-Cu_2O thin film on the copper substrate. In this investigation an analysis of scanning electron micrography(SEM) and photoluminescence for the samples, prepared by 2 methods are presented. Also n-Cu_2O thin films can be prepared by immersing copper plates in 10^{-3} M HCl solutions.

SEM micrographs reveal that the size of crystallites are larger for the samples prepared by $CuSO_4$ solution when compared to that of the samples prepared by HCl solution. Very nice hexagonal crystallites can be obtained when the copper plates are immersed in $CuSO_4$ solutions. A porous nature can be observed in n-Cu_2O films prepared by immersing copper plates in HCl solutions. Photoluminescence spectrum of the samples prepared by $CuSO_4$, shows a red

shift compared to that of the samples prepared by HCl solutions. This shift of the photoluminescence spectra may be due to the size effect of the crystallites formed on the copper substrate as observed in SEM micrographs. A remarkable stability can be seen in the photoelectrodes prepared by $CuSO_4$ solutions in KI (10^{-2}M)+I_2(10^{-4}M) solutions. A considerable photocurrent decay rate for the samples prepared by HCl solutions may be due to the photodegradation of the additional compound formed (CuCl) during the preparation of the samples as detected by XRD measurements. CuCl dissolves in the electrolyte under illumination.

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