E1-15 Stable p-Cu_2O/n-TiO_2 junction photoelectrode

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Recently TiO_2 based nanoporous dye sensitized solar cells became popular, since the behaviour of large surface area exposed to the dye adsorption. TiO_2 is a wide band gap (~ 3.0eV) chemically stable n-type semiconductor and transparent nanoporous films can be obtained making TiO_2 in colloidal forms. In this study we are using transparent nanoporous films to fabricate n-p junction with thermally prepared p-Cu_2O photoelectrode. TiO_2 colloid is made from $TiCl_4$.

These colloidal particles were spread on a well-cleaned thermally prepared p-Cu_2O surface using a glass rod to form a very thin layer of TiO_2. After that, p-Cu_2O photoelectrodes with thin films of TiO_2 are kept in a furnace maintained at 200°C for 2 h. Photoelectrodes prepared by this method exhibit a remarkable stability in KI (10^{-2}M)+ I_2 (10^{-4}M) solutions, when compared to that of bare p-Cu_2O. Shape of the photocurrent action spectrum of p-Cu_2O/n-TiO_2 junction photo-electrode is similar to that of bare p-Cu_2O, indicating that most of the photogenerated carriers are generated due to light absorption of p-Cu_2O in the p-Cu_2O/n-TiO_2 junction photoelectrode. Here, TiO_2 transparent film acts as a protective layer to p-Cu_2O. In addition, space charge electric field produced from p-Cu_2O/n-TiO_2 junction photoelectrode is larger than the electric field produced at bare p-Cu_2O-electrolyte interface. As a result, charge separation is increased with the junction photoelectrode. This investigation promotes the idea of using p-Cu_2O to make solar energy conversion devices at low cost. Bare TiO_2 photoelectrodes show a feeble photoresponse with visible light irradiation.

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