E1-03 ITO/n-Cu_2O/ p-Cu_xS thin film solar cell

L D R D Perera[1], R Wijesundara[1], W Siripala[1], K D Jayasuriya[1], K T L de Silva[2], J K D S Jayanetti[2]

[1]Dept of Physics, University of Kelaniya [2]Dept of Physics, University of Colombo, Colombo 3

Cuprous oxide is an attractive semiconductor material having the potential for use in low-cost solar cells. The method of electrodeposition of Cu_2O and utilization of electrodeposited Cu_2O in solar cells are less studied areas which need further investigations. A study was therefore carried out to ascertain the possibility of using electrodeposited Cu_2O in low-cost solar cells by fabricating an ITO/n-Cu_2O/p-Cu_xS thin film heterostructure.

Thin films of Cu_2O were potentiostatically electrodeposited on ITO coated glass substrates. The Cu_2O layers were partially sulfided by spraying a Na_2S solution to form a thin Cu_xS layer. The optical absorption, spectral response and dark and illuminated I-V measurements of the ITO/n-Cu_2O/p-Cu_xS system were obtained to study the properties of the cell. The cell exhibited a V_{oc} of 170mV a J_{sc} of ~ 0.5mA/cm^2 under AM 1.5 illumination through the ITO substrate. The spectral response measurements did not indicate an enhancement of the sensitive spectral range of the system beyond the absorption edge of Cu_2O. The I-V characteristics showed considerable rectification, high series resistance and a low fill factor. It was also revealed that this cell structure possessed an effective potential barrier of ~ 0.5V.

The preliminary results suggest the possibility of utilizing electrodeposited Cu_2O in combination with p-Cu_xS in developing a low-cost solar cell.

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