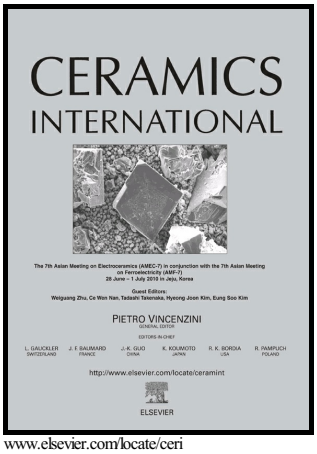

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Abstract

In this work, novel, non-toxic and cost effective ZnS-Cu-GO nanocomposite is synthesized via wet chemical route to study its photovoltaic properties. Three samples including ZnS ,ZnS-Cu and ZnS-Cu-GO were prepared and deposited as sensitizers on ZnO coated FTO substrates to assemble PV devices.The samples were characterized using UV-Vis NIR spectroscopy, Atomic force microscopy (AFM).Electrochemical impedance spectroscopy (EIS) and AM 1.5 Sun Simulator. It was observed that ZnS-Cu-GO exhibitedsuperiorchargetransport, remarkably high open circuit voltage(0.8V) and Fill factor(0.806).The current density significantly enhanced and maximum solar cell efficiency was observed for ZnS-Cu-GO based PV device. A pronounced red shift of 360 nm in the absorption spectra was observed in the ZnS-Cu-GO due tofine dispersion of GO sheets .The AFM analysis showed that incorporation of GO and Cu maximized grain density and trench like grain boundaries in ZnS-Cu-GO which facilitated charge transport mechanism.A detailed electrochemical impedance study to probe charge dynamics in the prepared PV devices is presented herein.

Introduction:

A wide topic of interest in research community entails the tailoring of optical and electronic properties of group II-VI semiconductor nanoparticles because of their low cost synthesis, quantum confinement effect and favorable tuning of size controlled band gaps.These attributes make them highly suitable candidates for modern energy devices including photovoltaics and LEDs etc. [1]. ZnS is a group II-VI semiconductor compound which has a wide band gap (3.7eV) and is nontoxic unlike other chalcogenide compounds including cadmium sulfides and selenides etc. It acts as a suitable host crystal lattice structure for various dopants. Many of the researchers have studied metal doped ZnS nanostructures.Another route of modifying the properties of compound semiconductors is to synthesize their hybrids[2-5]. Recently it has been