Structural and Photoelectrochemical Characterization of Heterostructured Ag_2MoO_4-SnS_2 coated Carbon Sheet Photocapacitor

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Abstract

Photocapacitors that can harvest solar energy and store it in the form of electrical energy, are expected to solve the problem of unstable power output of solar cells under fluctuating sunlight. In the present study, a novel heterostructured Ag_2MoO_4-SnS_2 photocapacitive device was developed. In this device, SnS_2 nanoparticles act as capacitive platform *via* redox pseudocapacitance, whereas Ag_2MoO_4 molecules act as the active core of the device. The crystalline structure and the surface morphology of Ag_2MoO_4-SnS_2 coated carbon sheet was examined by powder X-ray Diffraction method (XRD) and Scanning Electron Microscopy (SEM) respectively. The XRD pattern indicates that Ag_2MoO_4 coated on carbon sheet is in β phase with respect to Ag_2MoO_4. The SEM analysis reveals Ag_2MoO_4 coated carbon sheet as hexagonal nanorods, and Ag_2MoO_4- SnS_2 coated carbon sheet as spherical nanoparticles. The device, when subjected to visible light illumination, showed a specific capacitance of 780 mF/cm^2 with an open circuit potential of 0.8 V *vs* Ag/AgCl electrode. The high capacitance obtained with this novel device may be attributed to the large specific area and high conductivity of the Ag_2MoO_4- SnS_2 coated carbon sheet. This research study has open up a new avenue for an effective heterostructured photocapacitor.

Keywords: Photocapacitor, photoelectrochemical characterization, specific capacitance, silver molybdate, carbon sheet