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Structural and photoelectrochemical characterization of heterostructured carbon sheet/Ag_2MoO_4-SnS/Pt photocapacitor

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Highlights

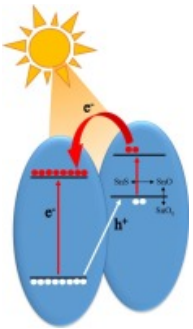
- Novel heterostructured carbon sheet/Ag_2MoO_4-SnS/Pt film as photocapacitor.
- Synthesis of cubical Ag_2MoO_4 film on carbon sheet by hydrothermal method.
- Heterostructured photocapacitor with high specific capacitance of 340 F/g at 1 sun.
- The device responds to diffused light as well.

Abstract

Photocapacitors can harvest solar energy and store it in the form of electrical energy and are expected to solve the problem of unstable power output of solar cells under fluctuating sunlight. In the present study, a novel heterostructured carbon sheet/Ag_2MoO_4-SnS/Pt photocapacitor was developed. In this photocapacitor, SnS nanoparticles act as capacitive platform *via* redox pseudocapacitance, whereas Ag_2MoO_4 molecules act as the active core of the photocapacitor. The crystalline structure and the surface morphology of Ag_2MoO_4-SnS film on 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 film on carbon sheet is in β phase with respect to Ag_2MoO_4. The SEM images reveal Ag_2MoO_4 film on carbon sheet composing of cubic structures, and SnS film on carbon sheet/Ag_2MoO_4 composing of spherical nanoparticles. The carbon sheet/Ag_2MoO_4-SnS/Pt heterostructured photocapacitor, when subjected to visible light illumination, showed a specific capacitance of 340 F/g with an open circuit potential of 1.25 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 film. This research study has opened a new avenue for an effective heterostructured photocapacitor.

Graphical abstract



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Keywords

Photocapacitor; Photoelectrochemical characterization; Specific capacitance; Silver molybdate; Carbon sheet