

MoSe₂ Nanosheets: An Amazing Electrocatalyst for Hydrogen Evolution Reaction and Counter electrode in Dye Sensitized Solar Cell

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Transition metal dichalcogenides (TMDs) nanosheets have usually been prepared by deposition/exfoliation. Here, we report the colloidal synthesis of 2H-MoSe₂ nanosheets where the thickness was controlled by varying the amount of coordinating solvent. The selenium vacancy and large surface area of the nanosheets prompted us to use it as an electrocatalyst in hydrogen evolution reaction (HER). These nanosheets exhibited thickness dependent electrocatalytic HER performances with a low onset overpotential (130-135 mV) and a small Tafel slope (55-75 mV/decade); some of the best performance values seen in the literature. We also fabricated DSSC counter electrodes using these nanosheets achieving power conversion efficiency of 7.20% which is comparable with the devices fabricated using the more expensive Pt counter electrodes as seen in Fig. 1. These MoSe₂ nanosheets showed stability towards both in HER and as counter electrodes in DSSCs making them advantageous for practical applications.

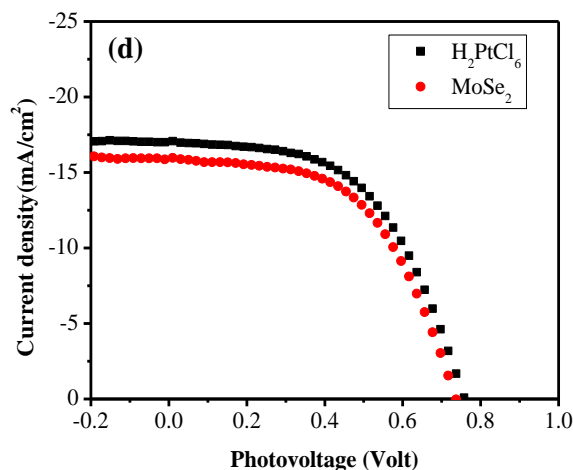


Fig. 1 Photovoltaic performance of DSSC fabricated using Pt and MoSe₂ as counter electrodes.