

Cadmium sulfide Co-catalyst reveals the crystallinity impact of nickel oxide photocathode in photoelectrochemical water splitting

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ABSTRACT

Nickel oxide (NiO) with p-type semiconducting behaviour was prepared via a direct anodisation of nickel (Ni) foam followed by calcination treatment. This method offers a direct photoelectrode synthesis without the intermediate step using a pre-synthesised NiO powder. NiO photocathodes with modulated crystallinity were prepared under elevated calcination temperatures. The beneficial effect of having higher crystallinity in generating higher cathodic photocurrent became obvious in the aid of cadmium sulfide (CdS) deposition. It was found that CdS can promote the excited charge transportation of NiO towards water reduction, thus revealing the effect of NiO crystallinity modulation. The role of CdS as co-catalyst rather than a photosensitiser can be useful in the future design of photoelectrodes.

Keywords:

Nickel oxide; Photocathode; Water splitting; Hydrogen generation