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Anthracene-decorated TiO₂ thin films with the enhanced photoelectrochemical performance

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Abstract

New insight of introducing new organic compounds for the efficient photogenerated charge separation is vitally important for the current solar energy conversion. Herein, (2Z,2'Z)-4,4'-(anthracene-2,6-diylbis(azanediyl))bis(4-oxobut-2-enoic acid) (ADA)/TiO₂ composite thin film is fabricated through the wet-impregnation strategy, which exhibits excellent photoelectrochemical performance (PEC). A combined study of ultraviolet-visible absorption spectra, scanning Kelvin probe maps, electrochemical and photoelectrochemical measurements reveals that the ADA/TiO₂ composite with narrow bandgap of 2.42 eV extends the photo response to the visible light region. The photocurrent generated by the optimal ADA/TiO₂ is 2.5 times higher than that of the pristine TiO₂. The result is attributed to the broader light absorption range and the separation of photoelectrons and holes prompted by ADA. Moreover, the high stability of the ADA/TiO₂ composite favors the practical application. The present work may offer a promising strategy for the low-cost PEC cell in the clean solar hydrogen production.

Keywords: TiO₂, Photoelectrochemical performance, Anthracene, Charge separation

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