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Two-dimensional nickel hydroxide/sulfides nanosheet as an efficient cocatalyst for photocatalytic H₂ evolution over CdS nanospheres

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ABSTRACT. The intriguing features of two-dimensional (2D) materials such as better charge carrier separation and abundant surface reaction sites endow them with potential applications as cocatalysts in photocatalysis. In this paper, a ternary 2D nickel hydroxide/sulfides nanosheet composed of Ni(OH)₂, Ni₃S₂ and Ni_xS₆ was loaded on CdS nanospheres by a simple chemical deposition route. The composition of nickel hydroxide/sulfides was determined clearly through an overall analysis using X-ray diffraction, transmission electron microscopy and X-ray photoelectron spectroscopy. Mott-Schottky, electrochemical impedance, steady-state and time-resolved photoluminescence spectroscopy were used to investigate the charge transfer process in CdS and Ni(OH)₂/Ni₃S₂/Ni_xS₆-CdS. The results confirm that a synergistic effect of Ni(OH)₂/Ni₃S₂/Ni_xS₆ on CdS has occurred under light irradiation, where the Ni(OH)₂ and nickel sulfides act as hole storage and surface reaction sites, respectively, to promote the charge transfer on CdS. The improved charge transfer and

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