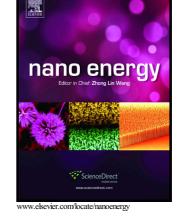
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PII: S2211-2855(17)30152-0 DOI: http://dx.doi.org/10.1016/j.nanoen.2017.03.021 Reference: NANOEN1849

To appear in: Nano Energy

Received date: 30 January 2017 Revised date: 3 March 2017 Accepted date: 7 March 2017

Cite this article as: Xianguang Meng, Qing Yu, Guigao Liu, Li Shi, Guixia Zhao Huimin Liu, Peng Li, Kun Chang, Tetsuya Kako and Jinhua Ye, Efficient Photocatalytic CO₂ Reduction in All-inorganic Aqueous Environment Cooperation between Reaction Medium and Cd(II) Modified Colloidal ZnS *Nano Energy*, http://dx.doi.org/10.1016/j.nanoen.2017.03.021

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Efficient Photocatalytic CO₂ Reduction in All-inorganic Aqueous Environment: Cooperation between Reaction Medium and Cd(II) Modified Colloidal ZnS

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Abstract

Although photocatalytic CO_2 reduction has been investigated extensively, veritably efficient " CO_2 photoconverter" that can be in particular operated at all-inorganic reaction system with good durability is very few. Herein, we show that photocatalytic CO_2 reduction rate over colloidal ZnS in all-inorganic aqueous environment can be improved by 1-2 orders of magnitude and reach exceptional performance after continuous regulation of reaction medium and grafting efficient cocatalysts. In the optimized condition, Cd^{2+} modified colloidal ZnS exhibited 95% HCOOH selectivity with 76% apparent quantum efficiency (280 nm). A modulated reaction medium maximizes the concentration of active reaction species and maintains efficient and stable photocatalytic reaction rate, while the cocatalyst significantly improves the separation of photo-excited carriers and CO_2 reduction rate with targeted product selectivity. The present reaction system is much superior over the widely used inorganic reaction system with low CO_2 conversion ability and organic complex photocatalysts with respect to long term reaction durability.

Graphical Abstract

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