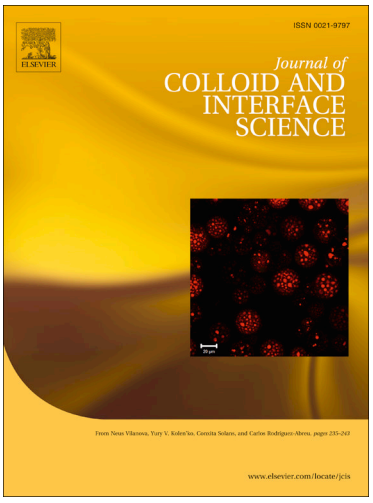

A Novel Hollow-Hierarchical Structured Bi_2WO_6 with Enhanced Photocatalytic Activity for CO_2 Photoreduction

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Abstract: Converting CO_2 into high-valued chemicals with sunlight is regarded as a promising way to solve the impending energy and environmental crisis. Development of efficient photocatalysts with suitable energy band gap, high stability and favorable structure is thus of very importance. Herein, a novel hierarchical Bi_2WO_6 photocatalyst assembled by Bi_2WO_6 nanosheets with a hollow and rod-shaped appearance has been developed *via* a facile hydrothermal process. Interestingly, we found that the hydrolysis of $Bi(NO_3)_3$ in water can produce solid $Bi_6O_5(OH)_3(NO_3)_5 \cdot 3H_2O$ microrods which can be transformed to hollow-hierarchical Bi_2WO_6 nanosheets by virtue of the Kirkendall effect. The developed Bi_2WO_6 nanosheets exhibit a 58 times higher specific surface area than that of bulk Bi_2WO_6 and a remarkable enhancement in electrochemical performance such as photocurrent and charge transfer. As a result, the hollow-hierarchical structured Bi_2WO_6 photocatalysts achieve a high CH_4 yield of 2.6 $\mu mol\, g^{-1}\, h^{-1}$, 8 times higher than that of bulk Bi_2WO_6. Moreover, the developed photocatalysts exhibit a high stability during the recycling experiments. This work may present a new strategy to attain hierarchical structured photocatalysts with high activity and stability toward CO_2 reduction.

Keywords: photocatalysts; Bi_2WO_6; CO_2 photoreduction; hierarchical structure.