Photocatalytic Reduction of Carbon Dioxide by Cu-Bi Nanoparticles Supported on TiO_2

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High efficient and selective carbon dioxide conversion is the biggest challenges in state-of-the-art. Stable carbon monoxide adsorption, the intermediate state on the surface of a catalyst, is the most important factor in efficient conversion of carbon dioxide to methane. In this study, we propose utilization of a bimetallic nanoparticle supported on the titanium oxide surface for stabilizing carbon monoxide binding strength. Bismuth nanoparticles have a strong oxygen affinity, so they help to maintain carbon monoxide binding on a bimetal surface. Therefore, it is possible to convert carbon monoxide to methane without detachment. Our results show a copper-bismuth nanostructure can convert carbon dioxide to methane 5 times more efficiently than copper nanostructure alone. These results may serve as a fundamental study for development of a better carbon dioxide photoconversion system.