Photocatalytic reduction of CO_2 to methanol by Cu_2O/TiO_2 heterojunctions

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Abstract

Conversion of CO_2 to low-carbon fuels using solar energy is considered an economically attractive and environmental friend route. The development of novel catalysts and the use of solar energy via photocatalysis is the key to achieve the goal of chemically reducing CO_2 under mild conditions. Thus, in this study, the novel Cu_2O/TiO_2 heterojunctions were used for CO_2-to-low-carbon fuels. The p-n heterojunction is able to enhance the separation of photogenerated electron-hole pairs. By UV-vis diffuse reflection absorption spectroscopy, it is clear that Cu_2O coupled with TiO_2 causes a red-shift to the visible light range. Under a 6-h UV-vis irradiation, 12.4-70.6 μmol methanol/g-catalyst can be generated by the Cu_2O/TiO_2 heterojunctions. However, excess Cu_2O in the Cu_2O/TiO_2 heterojunctions may cause less absorption of UV-vis light and decrease the excited electrons from TiO_2, which may obstruct the photoactivity for reduction of CO_2.

Keywords: *photocatalysis, CO_2, Cu_2O, TiO_2, p-n heterojunction, methanol.*

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