Graphene oxide and its hybrids as photocatalysts for solar fuels

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Photocatalytic conversion of carbon dioxide (CO_2) to hydrocarbons such as methanol and ethanol makes possible simultaneous solar energy harvesting and CO_2 reduction, two birds with one stone for the energy and environmental issues. This work describes a high photocatalytic conversion of CO_2 to methanol using graphene oxides (GOs) as a promising photocatalyst. Modified Hummer's method has been applied to synthesize the GO based photocatalyst for the enhanced catalytic activity. The photocatalytic CO_2 to methanol conversion rate on modified graphene oxide (GO-3) is 0.172 □mole g-cat^{-1} h^{-1} under visible light, which is six-fold higher than the pure TiO_2 (P-25). Further, Cu and MoS_2 nanoparticles were deposited on GO as co-catalysts to enhanced the photocatalysis reaction. Not only methanol, but also acetaldehyde were detected. Total solar to fuel yield of 6.8 □mole g-cat^{-1} h^{-1} have been achieved, which is 240 times enhancement relative to the commercial P-25 photocatalyst. Detailed study one the mechanism and selectivity of the products will be addressed in this paper.

Reference:

[1] H.C. Hsu *et al.*, *Nanoscale* **5**, 262-268 (2013).