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: