Preliminary study of reduced graphene oxide-titanium (rGO-TiO_2) photocatalyst for CO_2 reduction into methane: the physicochemical analysis & photocatalyst performance

ABSTRACT

The two major global issues; climate change and global energy demand will have been increasing in the future especially in both developing and developed countries. These two major global issues are basically due to the industrial activity and advanced lifestyle in that country. Therefore, the Carbon Capture and Conversion (CCC) method had been used in this research work. The CCC method has been used to capture and convert the CO_2 gas into hydrocarbon fuels such as methane gas. The Reduced graphene oxide-Titanium (rGO-TiO_2) sample in this experiment has been used to evaluate two research questions: the effect of synthesis method in sample's physicochemical properties and the photocatalytic performance. There are three synthesize methods had used to extract the samples; solvothermal method by using a Tetrabutyl Titanate powder (TBT) as raw material, hydrothermal method by using TBT as raw material and hydrothermal method by using anatase P90 TiO_2 powder as a raw material. These three samples were fused at fixed temperature and treatment time with 180oC and 8 hours, respectively. The physicochemical properties of these three samples had been characterized via X-ray Diffractometry (XRD) and UV-Vis spectrophotometer. Furthermore, the Gas Chromatograph (GC) was used to examine the photocatalytic performance at the end of this experiment. The rGO-TiO_2 (H1) sample shows the best photocatalytic performance with 700 nmol/gcat number of methane (CH4) yield within 8 hours which obviously higher than rGO-TiO2 (S) and rGO-Anatase TiO_2 (H2) with only 387 nmol/ gcat and 297 nmol/gcat respectively. It can be concluded that the synthesis method had been affecting the physicochemical properties and the photocatalytic performance in photocatalysts.