

CO₂ photoreduction into fuels using TiO₂ based photocatalyst

Mohd Hasmizam Razali
Faculty of Science and Marine Environment,
Universiti Malaysia Terengganu
Kuala Nerus, Terengganu, Malaysia
mdhasmizam@umt.edu.my

Abstract

Carbon dioxide (CO₂) emission from fossil fuel utilization poses a potential threat to global climate. Recent development in CO₂ reduction opens up new possibilities of utilization of CO₂ as a carbon feedstock for fuel generation and commodity chemicals. In this research, TiO₂-based photocatalysts have been extensively investigated for the CO₂ photoreduction into hydrocarbons in aqueous solutions under environmental conditions to understand their reduction activity and selectivity. The physicochemical properties of the photocatalysts were characterised by X-ray diffraction (XRD), field emission scanning microscopy (FESEM), transmission electron microscopy (TEM), high resolution transmission electron microscopy (HRTEM) and X-ray photoelectron spectroscopy (XPS). The adsorption, surface area, and porosity were studied using nitrogen gas adsorption and UV-Vis DRS was used for band gap measurement. The photocatalytic activity of the synthesised photocatalysts was tested for carbon dioxide (CO₂) photoconversion into fuels using home-built micro reactor system. The results obtained show that, CuO loaded TiO₂ nanotubes demonstrated the highest CO₂ conversion (100%) because of their effective separation of photogenerated electron-hole pairs with the presence of CuO particles.

Keywords: CO₂; reduction; TiO₂; fuels; photocatalyst.

Short biography

Mohd Hasmizam Razali has a PhD degree in Materials Engineering (Nanomaterials) from Universiti Sains Malaysia (USM), MSc. in Chemistry (Catalyst) and B.Sc (Hons) in Chemical Industry from Universiti Teknologi Malaysia (UTM). Currently he is an Associate Professor at Faculty of Sciences and Marine Environment, Universiti Malaysia Terengganu (UMT), Malaysia. He has published more than 60 technical papers in journals and conference proceedings locally and internationally related to the functional nanomaterials research. Owing to their significant impacts to the science, economy and society, his innovative research and inventions have attracted global and national interests, enabling him to secure financial support from both private and government agencies. He has been awarded Who's Who in the World for 3 years in a row 2013, 2014 and 2015 by The Marquis Who's Who Publications Board. In 2014, the Cambridge Biographical Centre listed him as one of 2000 Outstanding Intellectuals of the 21st Century. On top of that, he is also the recipient of the MAWHIBA Award and GENEVA Gold Medal Award in 1999.

