Photocatalytic Removal of Cyclohexane on Visible Light-Driven Gallium Oxide/Carbon Nitride Composites Prepared By Impregnation

Shu Chin Lee[1], Wee Shern Chew[2], Hendrik O. Lintang[1], Leny Yuliati[1*]
[1]*Centre for Sustainable Nanomaterials, Ibnu Sina Institute for Scientific and Industrial Research, Universiti Teknologi Malaysia, 81310 UTM Johor Bahru, Johor, Malaysia*
[2]*Department of Chemistry, Faculty of Science, Universiti Teknologi Malaysia, 81310 UTM, Johor Bahru, Johor, Malaysia*
***Corresponding author: leny@ibnusina.utm.my**

ABSTRACT

Carbon nitride is a material of interest for photocatalytic reactions due to its catalytic and visible light absorption properties. However, its photocatalytic activity is still low. Hence, modifications must be carried out to improve the photocatalytic activity of carbon nitride. In this work, a series of gallium oxide/carbon nitride composites with various gallium to carbon ratios (Ga/C = 1-50 mol%) was prepared by impregnation method for removal of cyclohexane under visible light irradiation for the first time. The successful preparation of gallium oxide/carbon nitride composites was supported by several characterization techniques. X-ray diffraction (XRD) patterns and diffuse reflectance UV-visible (DR UV-vis) spectra revealed that the increased Ga/C ratio resulted in the increased formation of Ga_2O_3. Furthermore, all the prepared composite samples also showed visible light absorption up to about 430 nm. In the photocatalytic removal of cyclohexane under 6 h of visible light irradiation, sample with low loading of 1 mol% Ga/C improved the photocatalytic activity of carbon nitride for two times. The high activity obtained on the gallium oxide (1 mol%)/carbon nitride composite clearly suggested the presence of synergic effect between small amount of gallium oxide and carbon nitride when they were combined. This study showed that a visible light-driven gallium oxide/carbon nitride composite could be prepared by impregnating a small amount of gallium oxide on carbon nitride and the composite is a potential photocatalyst for removal of cyclohexane under visible light irradiation.

| Carbon nitride | Visible light | Gallium oxide | Cyclohexane |

TUD-1 Supported Vanadium-Doped Titania Photocatalyst

Chik Yong Wi[1], Yee Khai Ooi[1], **Siew Ling Lee[2*]**
[1]*Department of Chemistry, Faculty of Science, Universiti Teknologi Malaysia, 81310 UTM Johor Bahru, Johor, Malaysia*
[2]*Center for Sustainable Nanomaterials, Ibnu Sina Institute for Scientific and Industrial Research, Universiti Teknologi Malaysia*
***Corresponding author: sllee@ibnusina.utm.my**

ABSTRACT

New photocatalyst of Techniche Universiteit Delft-1 (TUD-1) supported 5 mol% V doped TiO_2 (5V-TiO_2/TUD-1) exhibited enhanced activity in methylene blue photodegradation. XRD results revealed the presence of both anatase and rutile phases in the V-doped TiO_2 sample. After loading onto TUD-1, the crystallinity of the sample dropped significantly, implying well dispersion of both V and TiO_2 on the TUD-1. DRUV-Vis results suggested alteration of Ti species in the presence of TUD-1. Besides, the band gap energy of V-doped TiO_2 decreased after loading onto TUD-1. The sample 5V-TiO_2/TUD-1 possessed high surface area of 626 m^2/g. The photocatalytic performance of the sample was evaluated through the photodegradation of methylene blue under UV irradiation. It has been demonstrated that 5V-TiO_2/TUD-1 was a better photocatalyst compared to TUD-1 and unsupported V-doped TiO_2. The current findings strongly indicated that TUD-1 played an important role as support to improve the photocatalytic activity of V-doped TiO_2.

| TUD-1 | Titania | Vanadia | Photocatalyst |