Effective photocatalytic degradation of anthropogenic dyes using grapheme oxide grafting titanium dioxide nanoparticles under UV-light irradiation

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Abstract

Graphene oxide grafting titanium dioxide nanoparticles (TiO_2-GO nanocomposite) was successfully synthesized by a simple solvothermal method. The synthesized TiO_2-GO nanocomposite were systematically characterized by various physico-chemical techniques such as X-ray diffraction (XRD), Fourier transform infrared (FTIR) spectroscopy, field emission scanning electron microscopy (FESEM), high resolution transmission electron microscopy (HRTEM), X-ray photoelectron spectroscopy (XPS), and Raman spectroscopy. The XRD results confirm the crystallinity of synthesized bare titanium dioxide nanoparticles (TiO_2 NPs), pristine graphene oxide (GO) and TiO_2-GO nanocomposite with high pure in nature. The average size of the bare TiO_2 NPs was around 5 nm and were dispersed over the wrinkled graphene layers. Raman spectrum shows the resulting GO and TiO_2-GO nanocomposite exhibit moderate graphitization with the intensity of D to G value was 1.1 and 1.2, respectively. The chemical state, functionality and composition (carbon, oxygen and titanium) of the resulting TiO_2-GO nanocomposite were revealed by XPS analysis. The photocatalytic activity of synthesized TiO_2-GO nanocomposite was investigated on the degradation of hazardous organic dyes (methylene blue (MB) and methyl orange (MO)) under UV-light irradiation and was compared with bare TiO_2 NPs and were presented based on the preferred propagation path of induced electrons that leads to generation of O_2. The resulting TiO_2-GO nanocomposite achieve a maximum degradation efficiency of 100 and 84% on MB and MO in a neutral solution within 25 and 240 min, respectively under UV-light irradiation, the results show that the GO plays an important role in the enhancement of photocatalytic performance. The high Photocatalytic efficiency due to the increased light absorption, the reduced charge recombination with the introduction of GO. Moreover, the simple and affordable solvothermal derived TiO_2-GO nanocomposite exhibit rapid photocatalytic degradation on MB in 25 min of UV-light irradiation.

Reference:

R. Atchudan, T.N. Jebakumar Immanuel Edison, S. Perumal, D. Karthikeyan, Y.R. Lee, Journal of Photochemistry and Photobiology A: Chemistry, 333 (2017) 92-104.