Preparation of g-C3N4/TiO2 Heterojunction Photocatalysts for Photocatalytic Applications

Jongee Park(jongee.park@atilim.edu.tr)[1], Pelin Gündoğmuş[2], Abdullah Öztürk[2]

[1]Atilim University, Department of Metallurgical and Materials Engineering, 06836, Ankara, Turkey, [2]Middle East Technical University, Department of Metallurgical and Materials Engineering, 06800, Ankara, Turkey

Abstract

TiO_2 is the one of the most used semiconductors for waste water/air purification and solar cell applications thanks to its superior properties that include low cost, non-toxicity, chemical and biological stability [1]. However, TiO_2 is only active in the UV light with a wavelength lower than 385 nm [2, 3], because it has a large band gap (3.2 eV for anatase and 3.0 eV for rutile). This low photo quantum efficiency causes high recombination rate of electron/hole (e^-/h^+). In order to improve solar light efficiency and decrease e^-/h^+ recombination rate, several strategies were applied [4]. Among them, heterojunction with another semiconductor has great attention. g-C_3N_4 is a good candidate due to its low band gap (2.7 eV). Li et al. [5] report that g-C_3N_4/TiO_2 heterojunction photocatalysts shows the better solar light photocatalytic activity.

g-C_3N_4/TiO_2 heterojunction photocatalysts were successfully synthesized with changing g-C_3N_4 ratio of the samples using hydrothermal method. Synthesized samples were compared with the control groups which are phase pure TiO_2, g-C_3N_4 and commercial TiO_2 powder P25 (Degussa). The solar light photocatalytic activity of the sample was enhanced with increasing of the g-C_3N_4 content for some extent. Sample which include 80 wt% of g-C_3N_4 shows better photocatalytic activity. After that, this sample was exposed to various calcination temperatures. 400 °C was chosen as the best temperature for improving photocatalytic activities. Additionally, size, shape and morphologies of the powders were examined by field emission scanning electron microscopy (FESEM). Crystalline phases of the samples were investigated using X-ray diffraction analysis (XRD) analysis. Fourier transform infrared spectroscopy (FT-IR) analysis was applied to investigate chemical structures of the samples.

Keywords: *Photocatalytic activity, g-C3N4/TiO2, heterojunction, photocatalyst*

References

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Biography

Jongee Park is a Professor in the Department of Metallurgical and Materials Engineering of ATILIM University. He received the B.S. and M.S. degrees from Hanyang University in 1993 and 1995, respectively, then Ph.D. degree from Middle East Technical University, in 2008. His major research areas are photocatalytic TiO2 nano powders, dye-sensitized solar cells, dental ceramics, and glass-ceramics.