Photocatalytic Degradation of Phenolic Compounds on TiO_2-Supported Graphene Oxide and Reduced Graphene oxide Composites

H. Al-Kandari*[a], A. M. Abdullah[b], A. M. Mohamed[c], S. Al-Kandari[c]

a. *Department of Health Environment, College of Health Sciences, PAAET, P.O. Box 1428, Faiha 72853, Kuwait*
b. *Center of Advanced Materials, Qatar University, Doha, P.O. Box 2713, Qatar.*
c. *Chemistry Department, Kuwait University, P.O. Box 5969 Safat, 13060, Kuwait.*

H. Al-Kandari; email: halecatalysis@yahoo.com

Abstract

A Graphene oxide (GO) was prepared using modified Hummer`s method starting from graphite [1]. GO was impregnated on commercial nanoparticles P25 TiO_2 (GoTi) After that, reduced GOTi was obtained by (a) hydrogen gas at different temperatures or (b) hydrazine hydrate in microwave using a cyclic technique or (c) Solvothermal reduction. Characterization of all materials used were carried out using bulk and surface techniques e.g. XPS, XRD, Raman Spectroscopy, FTIR, SEM, UV-Vis diffuse reflectance, BET. The photocatalysis behavior of as-prepared catalyst were tested towards the phenolic compounds degradation and compared against commercial P25 TiO_2 in presence and absence of H_2O_2. The study revealed that the TiO_2 –supported RGO showing much higher performance than P25 TiO_2 in presence of H_2O_2. Figure 1 shows the phenol degradation (20 ppm) in presences of different prepared catalysts.

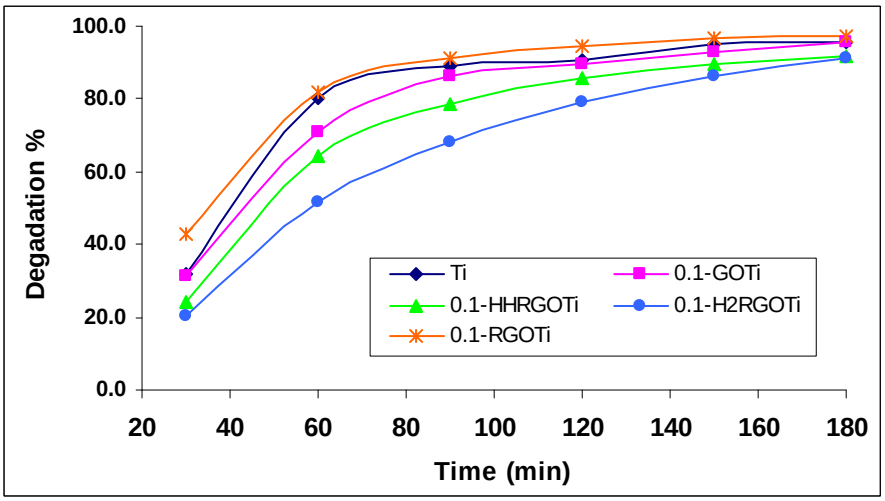

Figure 1. Kinetics of phenol degradation (20 mg/L) under 300 W UV illumination in presence of (a) Ti, (b) GOTi, (c) H2RGOTi450, (d) HHRGOTi and (e) RGOTi catalysts. A 70 µL of H_2O_2 was used with all catalysts.

1. Hummers, W. S. Offeman, R. E. (1958) Preparation of graphitic oxide, *J. Am. Chem. Soc.*, 80 (6), 1339-1339.