g-C$_3$N$_4$ Based Tungsten/Molybdenum Oxide Composites: Synthesis, Characterization and Photo degradation of Organic Pollutants

Muhammad Tariq [1*], Zainab Waheed[1], Muhammad Naeem Ashiq[1], Naseem Abbas[1], Ajaz Hussain[1], Khalid Mahmood[1] [1] Institute of Chemical Sciences, Bahauddin Zakariya University, 60800, Multan, Pakistan

Abstract

In this study, two g-C$_3$N$_4$ based metal oxide ternary composites were synthesized having general formulas g-C$_3$N$_4$-WO$_3$/rGO and g-C$_3$N$_4$-MoO$_3$/rGO by employing facile ultrasonic assisted wet-impregnation methodology. The prepared photocatalysts were characterized by Powder XRD, SEM, EDX and FTIR. Photocatalytic activity of the synthesized photocatalysts was evaluated by performing photocatalytic degradation test of two different dyes MB and Rh-B. g-C$_3$N$_4$-MoO$_3$/rGO shows better degradation efficiency than g-C$_3$N$_4$-WO$_3$/rGO photocatalyst by degrading 79% of Rh-B and 73% of MB in 180 minutes.

Introduction

Earth has been facing serious problems related to energy, water, food, population and pollution since last few decades. Unfortunately, the rapidly increasing world population and living standards of humans are resulting in the form of water stress along with increased discharge of dangerous chemicals in the form of sewage into the environment. Specially the rapidly expanding industries in the developed countries are playing a major role in increasing environmental problems such as air and water pollution[1-3].

Experimental and Results/Discussion

The g-C$_3$N$_4$-MoO$_3$/rGO ternary nanocomposite was prepared via the ultrasonic assisted wet impregnation method. Briefly, a certain amount of GO solution (1.0 wt%) was added into 40 mL combined solution of ethanol and water (1:1). The solution was ultra-sonicated for about 1 h. Appropriate amount of MoO$_3$ (30wt%) was added in the solution mixture under stirring for a period of 2 h. After that, suitable quantity of g-C$_3$N$_4$ (70 wt%) was added into the mixture while stirring. The suspension was then heated and kept on stirring until all the solvent evaporated. The product obtained was dried at 60 ºC in a drying oven and calcined at 400 ºC for 1 h.
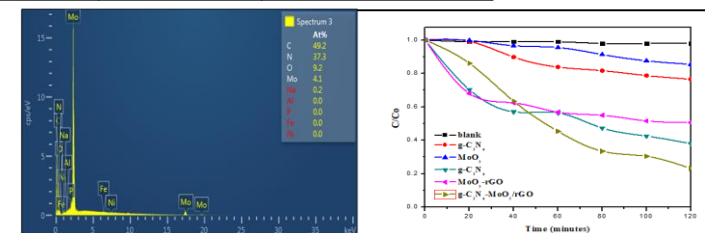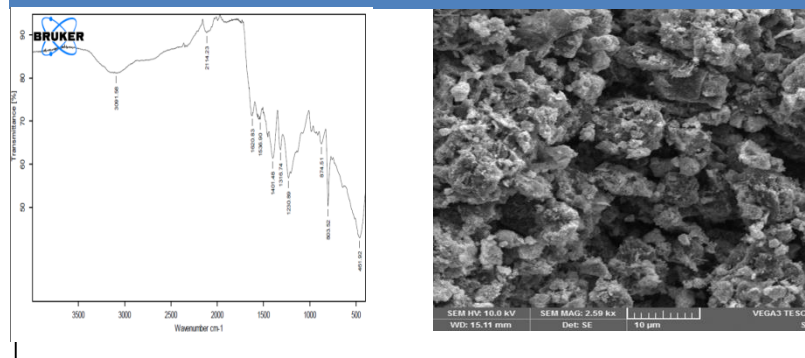
Conclusion

Graphitic carbon nitride based ternary composite of molybdenum oxide/reduced graphene oxide was synthesized by employing ultrasonic assisted wet-impregnation method. The g-C$_3$N$_4$-MoO$_3$/rGO ternary nanocomposite degraded Rh-B & MB with degradation efficiency of 79% and 73% respectively in 180 minutes.

1. Nassem A., Rubab, N, N. Sadiq, Manzoor. S. , M.I. Khan, J.F.Garcia, I.Aragao, Tariq,M, Zeeshan, A, G.Yasmin, water- 2020, 12, 2285;
2. Qamar, M., Gondal, M., & Yamani, Z. (2009). *Catalysis Communications, 10*(15), 1980-1984.
3. Phuruangrat, A., Cheed-Im, U., Thongtem, T., & Thongtem, S. (2016). *Materials Letters, 173*, 158-161.