

Laser induced graphene -Titanium (IV) oxide composite driven adsorption and photodegradation of methyl orange.

Brhane Amha Tesfahunegn

Ben Gurion University of the Negev, Beersheba, Israel.

brhaneam@post.bgu.ac.il

Dyes are extensively used in industries such as textile, leather, cosmetics, printing, pharmaceutical, food processing and research laboratories [1]. Early developed treatment methods such as biological digestion, chemical oxidation, activated carbon and coagulation are not efficient in removing methyl orange [2]. Novel Laser induced graphene (LIG)/TiO₂ material were prepared for efficient adsorption coupled with photodegradation of methyl orange. Laser induced graphene was prepared by direct irradiation of CO₂ laser with $\lambda=10.6 \mu\text{m}$ on to polyamide material which has high level of performance. At PH 7, the adsorption was found to be 99.9% ,88.6% and 87.68% for 5 ppm, 15 ppm and 20 ppm respectively. The novel composite showed 3 times and 6 times higher photodegrading capacity comparing to pristine TiO₂ and pristine LIG respectively. In broad sense the novel and efficient adsorbent and photocatalyst is required to reduce the budget for wastewater treatment, and therefore to tackle water pollution problem.

References

- [1] Lei, X., Li, X., Ruan, Z., Zhang, T., Pan, F., Li, Q., Xia, D., & Fu, J. (2018). Adsorption-photocatalytic degradation of dye pollutant in water by graphite oxide grafted titanate nanotubes. *Journal of Molecular Liquids*, 266, 122–131.
- [2] Nalini Neethu and Tanushree Choudhury. (2018) . Treatment of Methylene Blue and Methyl Orange Dyes in Wastewater by Grafted Titania Pillared Clay Membranes. *Recent patent on nano technology* ,3 (2018) 200-207.

Figures

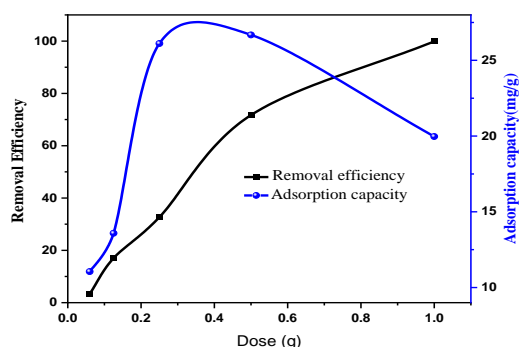


Figure 1 : The effect of TiO₂ /LIG composite on the removal efficiency and adsorption capacity at PH=7.0 , Temperature 298 K for 20 ppm initial concentration of methyl orange .

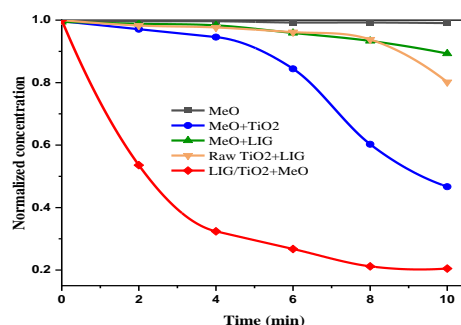


Figure 2: The photocatalytic degradation of Methyl orange at 298 K, PH=7.0 C₀=20 ppm .