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Cu-doped TiO_2-graphene/alginate nanocomposite for adsorption and photocatalytic degradation of methylene blue from aqueous solutions

Robab Mohammadi[a,*], Bakhshali Massoumi[a], Behnaz Emamalinasabb[a], Hamed Eskandarloo[b]

[a]*Department of Chemistry, Payame Noor University, PO box 19395-3697, Tehran, Iran, Tel. +98 41 35421414, Fax +98 41 35431067, email: mohammadi_rb@yahoo.com (R. Mohammadi), Tel. +98 41 35492303, Fax +98 41 35412108, email: b_massoumi@pnu.ac.ir (B. Massoumi), Tel. +98 41 35412117, Fax +98 41 35419221, email: alinasabb@ymail.com (B. Emamlinasabb)*
[b]*School of Chemistry, College of Science, University of Tehran, Tehran, Iran, Tel. +98 21 66404647, Fax +98 21 66407719, email: eskandarloo@ut.ac.ir (H. Eskandarloo)*

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ABSTRACT

In this study, Cu-doped TiO_2-graphene/ alginate (Cu-TiO_2-GR/alginate) nanocomposite with high adsorption capacity and high photocatalytic activity was successfully prepared and then characterized via different analysis methods such as XRD, TEM, SEM, EDX, Raman and DRS. The photocatalytic activity and adsorption capacity of prepared nanocomposite were investigated by removal of methylene blue (MB), as a model organic pollutant, from aqueous solutions under black light irradiation. Based on results, Cu-TiO_2-GR/alginate nanocomposite could effectively remove MB, and demonstrate an excellent photocatalytic enhancement over Cu-TiO_2 and Cu- TiO_2-graphene samples. To understand the nature of adsorption process, the equilibrium adsorption isotherms were studied. The linear correlation coefficients of Langmuir, Freundlich and Temkin isotherms were obtained. Based on results, Langmuir isotherm model fitted the experimental data better than the other isotherm models. According to the Langmuir isotherm model, the maximum adsorption capacity of Cu-TiO_2-GR/alginate nanocomposite for sequestering MB was about 85.95 mg. Furthermore, negative ΔG^0 and ΔH^0 values resulted from thermodynamic investigation suggested that the adsorption of MB onto Cu-TiO_2-GR/alginate nanocomposite was simultaneous and exothermic in nature, respectively.

Keywords: Cu-TiO_2-GR/alginate nanocomposite; Photocatalytic activity; Adsorption isotherms; Thermodynamic investigation; Organic pollutant

*Corresponding author.