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Efficient Removal of Erichrome Black T with Graphene Oxide/Biomaterial Nanocomposite: Kinetics Stud

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ABSTRACT

Graphene oxide is Carbonaceous substances which is widely used in adsorption of different type of pollutants, in this work we have synthesize a new composite material with graphene oxide and a natural material in order to obtain a highly effective material for the adsorption of organic pollutants. A very toxic dye has been used as pollutant and the adsorption efficiency was very high 98%, the nanocomposite were characterize after that using SEM-EDX analysis and detailed kinetics study were performed in order to obtain the most adequate model for this adsorption.

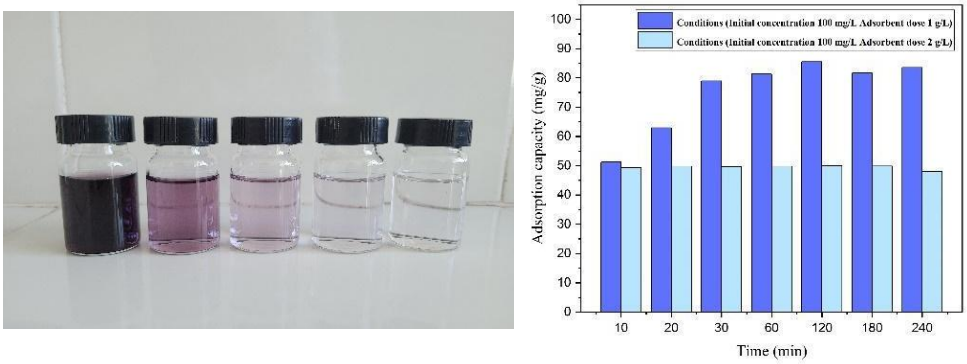

Figure1: Graphical abstract

Keywords: biomaterial, adsorption, graphene oxide, nanocomposite.

1 Introduction

The persistent water contaminants, especially dyes can cause multiple problems to human life and the environment, Eriochrome Black T (EBT) is a anionic dye and classified as naphthol azo dye that is resistant to biodegradation and other conventional treatment process. its widespread use in the textile industries has led to huge quantities being released into the environment. Adsorption process has been used as the most ecofriendly and attractive method to eliminate dye compounds from wastewater, due to its simple operation, high efficiency and insensitivity to several type of contaminants and toxic substances. Graphene oxide has proved his efficiency in adsorbing heavy metals and organic pollutants. [1] In this study a new adsorbent based on graphene oxide and natural local biomaterial were synthesized and used in the adsorption of toxic dye Erichrome Black T (EBT) a very high adsorption capacity were achieved in a short contact time of 30 minutes, a detailed kinetics study has been performed.

2 Experimental

2.1 Biomaterial preparation

After the collection of our local biomaterial from a tree widely planted in arid regions, the biomaterial was washed and dried at 80°C for 24 hours to allow complete elimination of moisture, it was then crushed with a mechanical grinder and sieved to 60µm and then stored for later use.

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2.2 Graphene oxide/Biomaterial synthesis

1 g of graphene oxide were added in 500ml of distillated water after sonication for 1 hour the GO solution were added in 200ml of biomaterial solution containing 5g of biomaterial which was activated with NaOH 1 M before that, the mixture were agitated for 24 hours and then washed with distillated water.

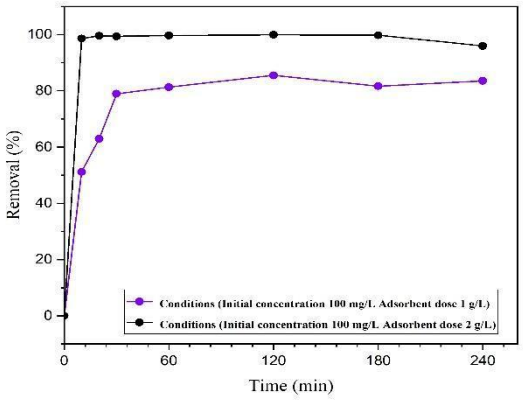
3 Results and Discussion

3.1 Synthesis and characterization of the nanocomposite

An SEM-EDX were performed in order to understand the structure of the novel nanomaterial.

3.2 Kinetics study

In order to understand the kinetics of the adsorption of EBT several experiments were performed and the analysis allow us to find the kinetics that explains the solute diffusion rate, which affects the adsorbate up take residence time at the solid-solution interface, including the diffusion process.



4 Conclusion

In this work, the adsorption of EBT with graphene oxide/biomaterial composite has prove his efficiency with an elimination rate of 98%, the morphological attribute revealed the existence of a very high degree of porosity and thus the ability to adsorb several types of organic pollutants such as dyes, This study also enables us to envisage the use of this adsorbent in real industrial effluents.

References

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