FAKULTA MECHATRONIKY,
INFORMATIKY A MEZIOBOROVÝCH
STUDIÍ TUL

SKFM 2022
studentská konference FM

Synthesis of Magnetic Graphene Oxide-Biopolymer for Ibuprofen Removal from Water

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ABSTRACT

In Ibuprofen, a common non-steroidal anti-inflammatory medication, has environmental impacts when it enters water systems. Treatment plants struggle to eliminate it, leading to aquatic harm. This study presents a greener fabrication of graphene oxide hybrid material for ibuprofen removal. Conditions like pH and the mass of the adsorbent have an influence on the ibuprofen's adsorption capacity. The adsorbent achieves 64.6 mg/g adsorption capacity after 60 minutes at a pH of 5 and at room temperature.

INTRODUCTION

Although Ibuprofen, a commonly used medication for pain, fever, and inflammation, is categorized as a non-steroidal anti-inflammatory drug (NSAID). While generally deemed safe and widespread in use, ibuprofen has been identified as having negative environmental impacts, particularly concerning water resources [1]. Adsorption, a successful technique using materials like carbon nanomaterials, can remove ibuprofen from water effectively and sustainably. Notably, graphene oxide (GO) is gaining attention due to its unique properties and efficacy in eliminating ibuprofen from water. As a two-dimensional nanomaterial, graphene oxide's large surface area and functional groups make it an efficient adsorbent [2].

METHODOLOGY

GO nanocomposite synthesized from previous report [3]. Method: Disperse 2g GO in 200mL water, add 2g biopolymer in 250mL water. Stir 24h at 75°C. Separate via filtration, water-ethanol wash, dry at 65°C. Results in GO-biopolymer. Synthesis involves co-precipitation of $FeCl_2 \cdot 4H_2O$ and $FeCl_3 \cdot 6H_2O$ with GO-biopolymer.

RESULTS AND DISCUSSION

The SEM depiction of the GO-biopolymer nanocomposite displays a morphology akin to the initially prepared GO, featuring crumpled layers. Observing the SEM images (Figure 1), it is evident that the Fe_3O_4 nanoparticles exhibit a consistently spherical structure when situated on the functionalized GO, comprising particles at the nanometer scale.

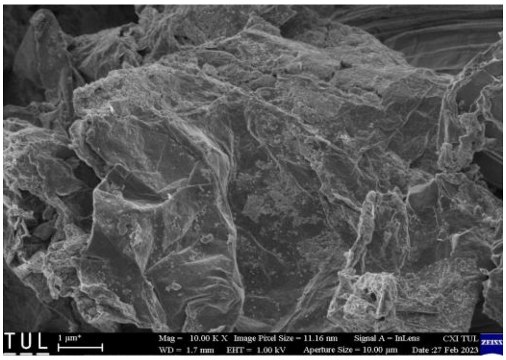

Figure 1: SEM image of GO-biopolymer nanocomposite.

According to Figure 2, this dataset illustrates the relationship between time intervals and adsorption capacity for a specific substance. 2 From the beginning, the capacity gradually increases to 64.6 mg/g after 60 minutes. This upward trend underscores a dynamic adsorption process.

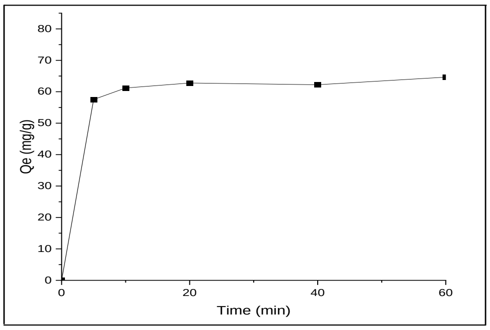

Figure 2: The effect of contact time on the adsorption capacity of the GO-biopolymer nanocomposite.

REFERENCE

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This work was supported by the Student Grant Competition (SGS) project at the Technical University of Liberec in 2023.