ULTRASONIC-ASSISTED ADSORPTION OF METHYLENE BLUE ON CYCLODEXTRIN POLYMERS

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APPROVAL AND ACCEPTANCE

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ULTRASONIC-ASSISTED ADSORPTION OF METHYLENE BLUE ON CYCLODEXTRIN POLYMERS[1]

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ABSTRACT

Background: Adsorption using natural polymers is known to remove pollutants from water. To improve the removal, a combination of adsorption and ultrasonic irradiation was introduced. In this study, the ultrasonic-assisted adsorption of methylene blue (MB) on cyclodextrin polymers (CDPs) from aqueous solutions was investigated. **Methods:** Batch adsorption of MB in aqueous solution by CDPs was conducted using a shaker and a sonicator at room temperature. Standard and residual solutions of MB were quantified using UV-Visible spectrophotometer. The effects of contact time and initial dye concentration, sorption kinetics and equilibrium isotherms were evaluated. **Results:** β-CDP showed the highest removal efficiency compared to γ-CDP and α-CDP, the least efficient. Pseudo-equilibrium was reached after approximately 120 min. The sorption of MB on CDPs followed the Ho-McKay's pseudo-second order kinetic mechanism with the liquid film diffusion and intraparticle diffusion as the rate-limiting steps. The amount of MB adsorbed on β-CDP at equilibrium increased with increasing initial MB concentration. The equilibrium data was analyzed using two- and three- parameter isotherm models. It was found that the sorption of MB on CDPs was best described by Sips isotherm. The BET surface area and total pore volume were not the primary factors in controlling the adsorption. The differences in sorption of MB by the CDPs could be credited to the size-matched structure and appropriate hydrophobicity of MB, the size of the CD cavity in the polymer, the average pore radius of the polymer and the amount of CD molecules in the polymer. **Conclusion:** The results showed the potential of ultrasonic-assisted adsorption process using these sorbents in a real wastewater treatment where the cationic dyes like MB is the contaminant.

Keywords: ultrasound, adsorption, methylene blue, cyclodextrin polymers, water, sorption kinetics, sorption isotherms

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