

## Application of Biopolymer for Adsorption of Methylene Blue Dye from Simulated Effluent: A Green Method for Textile Industry Wastewater Treatment

**Authors :** Rabiya, Ramkrishna Sen

**Abstract :** The textile industry releases huge volume of effluent containing reactive dyes in the nearby water bodies. These effluents are significant source of water pollution since most of the dyes are toxic in nature. Moreover, it scavenges the dissolved oxygen essential to the aquatic species. Therefore, it is necessary to treat the dye effluent before it is discharged in the nearby water bodies. The present study focuses on removing the basic dye methylene blue from simulated wastewater using biopolymer. The biopolymer was partially purified from the culture of *Bacillus licheniformis* by ultrafiltration. Based on the elution profile of the biopolymer from ion exchange column, it was found to be a negatively charged molecule. Its net anionic nature allows the biopolymer to adsorb positively charged molecule, methylene blue. The major factors which influence the removal of dye by the biopolymer such as incubation time, pH, initial dye concentration were evaluated. The methylene blue uptake by the biopolymer is more (14.84 mg/g) near neutral pH than in acidic pH (12.05mg/g) of the water. At low pH, the lower dissociation of the dye molecule as well as the low negative charge available on the biopolymer reduces the interaction between the biopolymer and dye. The optimum incubation time for maximum removal of dye was found to be 60 min. The entire study was done with 25 mL of dye solution in 100 mL flask at 25 °C with an amount of 11g/L of biopolymer. To study the adsorption isotherm, the dye concentration was varied in the range of 25mg/L to 205mg/L. The dye uptake by the biopolymer against the equilibrium concentration was plotted. The plot indicates that the adsorption of dye by biopolymer follows the Freundlich adsorption isotherm (R-square 0.99). Hence, these studies indicate the potential use of biopolymer for the removal of basic dye from textile wastewater in an ecofriendly and sustainable way.

**Keywords :** biopolymer, methylene blue dye, textile industry, wastewater

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