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Biosorption and Optimization of Methylene blue using Rice straw: RSM, Isotherm, Kinetics and Thermodynamics

Methylene blue is one of the waste textile dyes that has become a problem for the environment. In this study, rice straw was utilised to simulate the elimination of the methylene blue dye by biosorption using the response surface methodology (RSM). The pseudo-second-order kinetic model for rice straw was used to describe the methylene blue biosorption process. Two isotherm models—Langmuir and Freundlich were examined to suit the equilibrium data. As a biosorption isotherm, the Langmuir model outperformed the Freundlich isotherm model. Biosorption thermodynamic measurements revealed that Methylene Blue was adsorbing exothermically and spontaneously. The presence of functional groups, which are important binding sites involved in the process of methylene blue biosorption, was confirmed by Fourier Transform Infrared Spectroscopy (FTIR) spectra. SEM analyses were performed to evaluate the physicochemical characteristics of the biosorbent. Laboratory wastewater was processed to the ideal biosorption condition, and rice straw was used to remove methylene blue with an efficiency of 92 per cent. Another promising biosorbent that is affordable, environmentally benign, biodegradable, and cost-effective is rice straw. Thus, this research demonstrates that the dye removal process can be predicted using an RSM strategy and suggests that biosorption onto rice straw could be used as the primary dye removal technique for wastewater.

Biography:

I am a research scholar at the amity institute of environmental science (AIES) at Amity university. I am doing PhD in wastewater treatment at amity university. My recent publication is (Application of RSM for Bioremoval of Methylene Blue Dye from Industrial Wastewater onto Sustainable Walnut Shell (Juglans regia) Biomass) in Water (2022). My research interest includes wastewater treatment technology RSM, biosorption, adsorption, and artificial intelligence.