



## Comparative study of chitin and chitosan beads for the adsorption of hazardous anionic azo dye Congo Red from wastewater

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### ABSTRACT

Chitin (CH) and chitosan (CTS) beads used and compared for the adsorption of Congo Red (CR), an anionic azo dye, are reported in the present work. Initially, the adsorbents were prepared and characterized by scanning electron microscopy (SEM) and Fourier transform infrared (FT-IR) analysis. SEM images showed the heterogeneous and porous structure of the beads and FT-IR results confirm the presence of –OH, –NH<sub>2</sub>, and –NHCOCH<sub>3</sub> groups which are responsible for the adsorption of CR. Further, batch studies were conducted to evaluate the adsorption capacity of CH and CTS beads and the effects of the parameters like pH, adsorbate concentration, contact time, and dosage of adsorbents on adsorption were investigated. From the analysis, it was observed that the amount of CR adsorbed on both the adsorbents increases with increasing initial dye concentration and decreasing pH. The adsorption isotherms were analyzed using the Langmuir and Freundlich isotherms. The Langmuir isotherm was the best-fit adsorption isotherm model for the experimental data obtained from the non-linear chi-square statistic test. Further, the pseudo-first-order and second-order kinetic models were used to describe the kinetic data, and the rate constants were evaluated. The dynamical data fit well with the second-order kinetic model. The results indicate that CH and CTS beads could be employed as low-cost material for the adsorption of CR from wastewater.

*Keywords:* Chitin beads; Chitosan beads; Congo Red; Adsorption isotherms; Kinetics; Error analysis

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