**Kaolin-Chitosan Biocompatible Composites as Adsorbents for Wastewater Treatment: Influence of Chitosan concentration on Enhancement in Adsorption Characteristics**

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**Abstract**

Kaolin is one of the most abundant natural clays. It has a layered structure consisting of alternate alumina octahedral sheet and silica tetrahedral sheet hydrogen bonded together that share common plane of oxygen atoms (Jorge C. Miranda-Trevino, Cynthia A. Coles, 2003). The potential of using kaolin as an adsorbent for dye removal from aqueous effluents, with Congo red (CR) as the model compound has been investigated by Bo Jin and colleagues (Vipasiri Vimonses, Shaomin Lei, Bo Jin, Chris W.K. Chow, Chris Saint, 2009). They concluded that kaolin can be used as low-cost alternative for the removal of anionic dyes from waste water. Synthesis of biocompatible clay composites for water treatment is a recent development of increasing research interest. Clay-biopolymer composites made by intercalation of the biopolymer sodium alginate into Zn-Al and Mg-Al layered double hydroxides was found to enhance its adsorption for fluoride ions and Orange II dye (S. Mandal, V.S. Patil, S. Mayadevi, 2012). Such composites were also found to exhibit superior adsorption characteristics for acid dyes (Sanil Sebastian, S. Mayadevi, S. Mandal, 2014). In this paper we examine the characteristics and adsorption properties of kaolin-chitosan bio-composites prepared by the modification of natural kaolin. Kaolin-Chitosan composites containing different quantities of chitosan were prepared and its influence on the adsorption of CR dye has been investigated

The adsorbents were characterized by XRD, FT-IR, SEM, surface area and pore size analyzer. The adsorption capacity of pure kaolin for Congo red increased considerably on composite formation with chitosan and was dependent on the chitosan concentration in the composite. The best performance was observed at chitosan loading of 5%. At this loading, the adsorption capacity of the composite was 7.2 times higher than that of pure kaolin. The isotherm data fitted well with Freundlich and Temkin isotherm models. The Freundlich constant *k* for the composites exhibited a trend similar to that of surface area and pore volume indicating that *k* is related to the surface and pore characteristic of the adsorbent. The constant *n* in the exponent of Freundlich equation increased with increase in chitosan concentration. This may be due to the attractive interactions between the cationic biopolymer chitosan and the anionic dye CR, which increases with the amount of chitosan present in the adsorbent. The kinetic data fitted well with Lagergren first order and pseudo second order models. The kinetic rate constant decreased on composite formation indicating that the presence of chitosan slows down the adsorption of the dye on the composite.

**References**

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