



## **Kinetics and mechanism of using chitosan and silica as adsorbents for removal aqueous humic acid**

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Chitosan is a natural biopolymer. The sources of chitosan are shells of shrimp, crab and squid pen. Ricehusk is an agricultural waste residue remaining from rice mill. Rice husk can be processed chemically to obtain silica. Humic acid in natural water can be reacted with chlorine used for disinfection in the water treatment process and turned to betoxic substances called DBP (Disinfectant by-product). In this research, the chitosan and silica powders were used as adsorbents for the removal of humic acid in batch process. The point of zero charge of chitosan and silica powders were pH 8.8 and 8.6 respectively. The experimental results showed that adsorption capacity onto 0.2 g of chitosan and silica from humic acid solution at the concentration of 13.5 mg/L were 1.3 and 2.6 mg/g, respectively. The pseudo-first order and pseudo-second order were employed to determine the adsorption kinetics. It was found that the kinetics of adsorption could be elucidated by pseudo-second order. The initial rate of adsorption and the half-adsorption time were 0.5 mg/g-min and 2.1 minutes for chitosan powder, and 4.7 mg/g-min and 0.6 minutes for silica powder, respectively. From the plotted graph of kinetic results, two slopes were observed indicating that the transport processes of humic acid from bulk solution to be adsorbed at the surface of adsorbents occurred in 2 steps. The film diffusion was rate limiting step for both adsorbents.

**Keywords:** Chitosan; Silica; adsorption; humic acid.