



## Cationic surfactant adsorption on silica gel and its application for wastewater treatment

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### ABSTRACT

The adsorption of cetyltrimethylammonium bromide (CTAB), a well known cationic surfactant on silica gel and its application for organic bearing wastewater treatment was studied in detail. The study was conducted for both CTAB-spiked distilled water and real wastewater. The studies on adsorbent dose variation and removal kinetics were conducted to find the optimum dose and equilibrium contact time for CTAB removal. Interestingly, the adsorption capacity was found to be very high for real wastewater and the reaction occurred very rapidly compared to that of CTAB-spiked distilled water samples. The kinetic study revealed that the reaction followed the pseudo-second order reaction kinetics model. The isotherm followed four region isotherm models. The effects of various parameters such as pH, presence of electrolytes and operating conditions on the adsorption process were studied. High adsorption capacity was observed in presence of electrolytes and in alkaline condition. Kinetic study determined the rate limiting to be chemisorption. Regeneration of silica gel after its complete exhaustion was efficiently done using hydrochloric acid (18%). After the surfactant removal, the surfactant modified silica gel (MSG) was efficiently used for the removal of dyes and herbicide from water environment through the process called adsolubilization. Therefore, this would be a simple and efficient process for treatment of organic bearing wastewater especially textile wastewater.

**Keywords:** Adsorption; Cationic surfactant; CTAB; Silica gel; Herbicide; Dye; Surfactant modified silica gel; Adsolubilization

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