REMOVAL OF BENZENE USING FREE AND SURFACTANT MODIFIED SILICA NANOPARTICLES

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ABSTRACT

BTEX contaminations possess hazardous effect, mainly, on the human being due to its acute toxicity. Many BTEX removal technologies have been developed including biological, chemical and physical in which adsorption method is widely used as eco-friendliness process. Silica nanoparticles (SN) have been widely used in many application including recovery organic contaminations from the wastewater. The cationic surfactant modification using cetyltrimethylammonium bromide (CTAB) was conducted to improve its adsorption capacity of silica nanoparticles. The characterization of free (FSN) and surfactant-modified silica nanoparticles (MSN) was determined using Fourier transform infrared (FTIR) spectroscopy and scanning electron microscope (SEM) analysis. Benzene was used as a model BTEX and the adsorption experiment was carried out in batch mode. The influence of process parameter such as initial benzene concentrations, temperatures, surfactant loading and contact time on the benzene adsorption was evaluated. The pseudo-first order, pseudo-second order and Elovich models were used to evaluate benzene adsorption kinetics while Langmuir, Freundlich and Temkin isotherm models were employed. Surfactant loading with 10mM CTAB gave the highest benzene adsorption capacity. The adsorption capacity increased with contact time, however after 500 minutes, there was no significant change in benzene adsorption capacity. Benzene adsorption increased with the increase in initial benzene concentrations, reaching a plateau at an initial concentration of 5 mM. The Gibbs energy, ΔG were found to be negative while enthalpy, ΔH and entropy, ΔS are positive. The benzene adsorption kinetic data followed the pseudo-second order kinetic model, while the isotherm adsorption data were the best fitted to the Langmuir and Temkin isotherm models.
ABSTRAK


Unger, K. K., Jilge, O., Kinkel, J. N. and Hearn, M. T. W. (1986). Evaluation of advanced silica packings for the separation of biopolymers by high-


