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Design of experiment for treatment of arsenic-contaminated water using Schiff's base metal complex modified Amberlite XAD-2

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ABSTRACT

The present study aims to develop a method using multivariate design of experiment approach for the treatment of arsenic-contaminated water. A newly synthesized resin i.e. Amberlite XAD-2 modified with Schiff's base-iron complex is used as a solid surface for the removal optimization. The Schiff's base was synthesized by simple condensation reaction and its Fe(III) complex was prepared by refluxing Fe(III) salt with methanolic solution of Schiff's base. XAD-2 was impregnated with Fe(III)-Schiff's base complex, and FTIR spectroscopy was used to characterize the complex. Individual and interactive effects of pH, time, concentration, and sorbent amount on removal of arsenic were studied using factorial design approach. A face-centered Draper–Lin composite design predicted 100% removal efficiency at optimum variables; pH 5.5, concentration of arsenic 10 mg L^{-1}, sorbent amount 57 mg, and shaking time 160 min. A good agreement between experimental and predicted data was observed. Langmuir and Frendlich sorption isotherms showed the validity of model with the sorption capacity of 227 μ mol^{-1} g and 85.9 mmol g^{-1}, respectively. Sorption energy calculated from D–R adsorption isotherm was 12 kJ mol^{-1} and corresponded to the possible ion exchange nature of the sorption process. The kinetics of removal of arsenic has also been investigated.

Keywords: Design of experiment; Modified XAD; Arsenic removal; Schiff's base resin; Water treatment

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