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Zeolitic imidazolate framework-8: A novel nanoparticle for fluoride removal from aqueous solution taguchi experimental methodology

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Removal of fluoride from living entities is the foremost task as it is non-biodegradable and harmful pollutant mostly found in groundwater. In this study Zeolitic Imidazolate Framework 8 (ZIF-8) nanoparticles synthesis method and its efficiency in fluoride removal was examined from an aqueous phase. The optimum experiment value was developed by Taguchi method and characterization of nanoparticles was done by Fourier-transform infrared spectroscopy, X-ray powder diffraction and scanning electron microscope confirmed the particle and its particle size was 200-220 nm by Zetasizer. The result indicates time was considered as important factor in fluoride removal by ZIF-8 nanoparticle followed by adsorbent dosage, stirring rate, temperature, and pH. The optimum conditions for fluoride removal by ZIF-8 nanoparticles were found as time=15 min, adsorbent dosage 0.06 g/L, Stirring=400 RPM, temperature=20 °C, pH=8. Regression analysis ($R^2=0.90$) displayed the good covenant in predicted and experimental values. The experimental data showed that the adsorption system was shadowed by Langmuir isotherm model and isothermal multistage adsorption was also studied to understand in-depth of ZIF-8 nanoparticles for fluoride removal.

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