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Response surface optimization and modeling in heavy metal removal from wastewater—a critical review

Bayuo, Jonas

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Response surface optimization and modeling in heavy metal removal from wastewater—a critical review

Jonas Bayuo, Mwemezi J. Rwiza & Kelvin Mark Mtei

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Abstract

The existence of hazardous heavy metals in aquatic settings causes health risks to humans, prompting researchers to devise effective methods for removing these pollutants from drinking water and wastewater. To obtain optimum removal efficiencies and sorption capacities of the contaminants on the sorbent materials, it is normally necessary to optimize the purification technology to attain the optimum value of the independent process variables. This review discusses the most current advancements in using various adsorbents for heavy metal remediation, as well as the modeling and optimization of the adsorption process independent factors by response surface methodology. The remarkable efficiency of the response surface methodology for the extraction of the various heavy metal ions from aqueous systems by various types of adsorbents is confirmed in this critical review. For the first time, this review also identifies several gaps in the optimization of adsorption process factors that need to be addressed. The comprehensive analysis and conclusions in this review should also be useful to industry players, engineers, environmentalists, scientists, and other motivated researchers interested in the use of the various adsorbents and optimization methods or tools in environmental pollution cleanup.

Keywords

Adsorption; Factors; Modeling; Optimization; Process; Variables