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APPLICATION OF RESPONSE SURFACE METHODOLOGY (RSM) FOR OPTIMIZATION OF ZINC EXTRACTION FROM ANAEROBIC SEWAGE SLUDGE

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Abstract

The reuse of sewage sludge will be increasing in the future, with expansion of sewerage works and advanced sewage treatments. During anaerobic digestion of sewage sludge from wastewater treatment plants the humification of organic matter will have an important effect on the physico-chemical forms of heavy metals. The aim of our paper was to investigate mobility of zinc from dried anaerobic sludge (DANS) from municipal wastewater treatment plant (WWTP) via single step (simultaneous) extraction protocols. We tried to optimize extraction process as a function of amount of sludge biomass, concentration of extracting agent and reaction time. The three parameters namely 0.55 g of anaerobic sludge, 50.5 mmol/dm^3 HCl as extracting agent and 3 hour of reaction time were chosen as center points. The experimental data on extractable Zn concentration (c_{Zn}) from DANS were obtained by stripping chronopotentiometry and fitted into a quadratic polynomial model using multiple regression analysis. The optimal extraction parameters were studied using experimental Box-Behnken design under response surface methodology (RSM). Results showed that interaction effect of reaction time and amount of biomass to Zn extraction is minimal, but in combination with the concentration of HCl significant increase of extractable zinc from DANS was detected. The maximum metal solubilization was obtained at 0.55 g of DANS, 100 mmol/dm^3 HCl and 5 hour of reaction time. Correlation among to predicted and experimental data showed ability to reducing the number of total experiments from 39 to 17.

Key words: DANS, extraction, RSM, stripping chronopotentiometry, zinc

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