Desalination and Water Treatment
www.deswater.com

doi: 10.5004/dwt.2021.26966

218 (2021) 294–302
April

A novel weighted mean-squared error optimization model to obtain optimal conditions of adsorption factors for a lead removal process

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Received 15 July 2020; Accepted 31 December 2020

ABSTRACT

Lead (Pb) removal process from wastewater is an important issue to prevent health problems for people. For this particular purpose, a low-cost adsorbent may be beneficial for improving the adsorption capacity for the Pb removal process. The aims of this paper are four-fold. First of all, a *D*-optimal experimental design was selected to reduce experimental runs and its cost. Second, the effect of four adsorption design factors, stirring speed (rpm), adsorbent dosage (g), pH level, and initial metal concentration (ppm), was examined. Also, the yellow natural stone, which is from Bayburt, Turkey, was used as a cheap adsorbent for the Pb removal process from the solution. Third, a novel weighted mean-squared error optimization model was developed to obtain optimal adsorption levels for adsorption factors. Besides, a verification study was conducted to verify the results of the adsorption experiment. Finally, the lead (Pb(II)) removal capacity of the yellow Bayburt stone was obtained to be 46.031 mg/g, and the results of the experiment from the proposed methodology showed a good performance for the removal study.

Keywords: Adsorption; Lead; *D*-optimal experimental design; Optimization; Wastewater treatment

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