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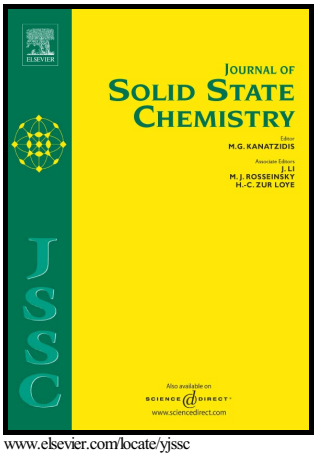

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Highly efficient removal of As(V) from aqueous solutions using a novel octanuclear Zn(II)-based polymer: synthesis, structure, properties and optimization using a response Surface methodology

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Abstract

A novel octanuclear Zn(II)-based polymer, $[Zn_8(BTEC)_2(ATZ)_2(\mu_3\text{-}OH)_2(\mu_2\text{-}OH)_4\ (H_2O)_2]_n$ (**1**), was hydrothermally assembled using 5-amino-1-H-tetrazole (HATZ) with 1,2,4,5-benzenetetracarboxylic acid (H_4BTEC). Complex **1** was characterized by single-crystal X-ray diffraction and TG. Owing to its unique characteristics, the ability of the $[Zn_8(BTEC)_2(ATZ)_2(\mu_3\text{-}OH)_2(\mu_2\text{-}OH)_4(H_2O)_2]_n$ to remove As(V) from aqueous solutions was investigated (The form of As(V) is AsO_4^{3-}). A series of experimental conditions of adsorption were studied, which included the pH value, contact time, adsorbent dose, adsorption temperature, initial concentration and shaking speed. The experimental results showed that complex **1** had a higher stable and relatively high (>98%) As(V) removal rate at pH 7–11. The adsorption process fitted well to the Langmuir model and the pseudo-second-order kinetic model. And the optimal adsorption conditions were also examined using a Box-Behnken design response surface methodology. In addition, complex **1** was further characterized by elemental analysis (CHN), photoluminescence(PL), XRD, IR spectroscopy before and after adsorption As (V).

Graphical abstract