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PII: S1004-9541(16)30453-0
DOI: doi:10.1016/j.cjche.2016.12.006
Reference: CJCHE 735

To appear in:

Received date: 17 May 2016
Revised date: 26 December 2016
Accepted date: 27 December 2016

Please cite this article as: Akbar Soliemanzadeh, Majid Fekri, Synthesis of clay-supported nanoscale zero-valent iron using green tea extract for the removal of phosphorus from aqueous solutions, (2017), doi:10.1016/j.cjche.2016.12.006

Separation Science and Engineering

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Abstract

This study addresses the synthesis of nanoscale zero-valent iron (nZVI) in the presence of natural bentonite (B-nZVI) using green tea extract. The natural bentonite and B-nZVI were then applied for the removal of phosphorus from aqueous solutions at various concentrations, pH levels and contact time. The desorption of phosphorus from adsorbents was done immediately after sorption at the maximum initial concentration using the successive dilution method. The characterization of FTIR, SEM, and XRD indicated that nZVI was successfully loaded to the surface of natural bentonite. The sorption of phosphorus on B-nZVI was observed to be pH-dependent, with maximum phosphorus removal occurring at the pH range of 2 to 5. The results demonstrate that the maximum sorption capacities of natural bentonite and B-nZVI were 4.61 and 27.63 $mg \cdot g^{-1}$, respectively. Langmuir, Freundlich, and Redlich-Peterson models properly described the sorption isotherm data. For either adsorbent, desorption isotherms did not coincide with their corresponding sorption isotherms**,** suggesting the occurrence of irreversibility and hysteresis. The average percentages of retained phosphorus released from natural bentonite and B-nZVI were 80% and 9%, respectively. The results indicated that sorption kinetics was best described by the pseudo-second-order model.