Response surface modeling of Cu(II) removal from wastewater using fish scale-derived hydroxyapatite: application of Box–Behnken experimental design

N. Mandal\textsuperscript{a}, S. Mondal\textsuperscript{a}, A. Mondal\textsuperscript{b}, K. Mukherjee\textsuperscript{a}, B. Mondal\textsuperscript{a,*}

\textsuperscript{a}Centre for Advanced Materials Processing, CSIR-Central Mechanical Engineering Research Institute (CSIR-CMERI), Mahatma Gandhi Avenue, Durgapur 713 209, India, Tel. +91 9932399947; email: n_mandal@cmeri.res.in (N. Mandal), Tel. +91 9851265212; email: mailsudipmondal@gmail.com (S. Mondal), Tel. +91 9775552143; email: kalisadhanm@yahoo.com (K. Mukherjee), Tel. +91 9434330504, +0343 6510218; Fax: +91 343 2546745; emails: bnmondal@rediffmail.com, bnmondal@cmeri.res.in (B. Mondal)

\textsuperscript{b}Department of Biotechnology, National Institute of Technology, Durgapur Mahatma Gandhi Avenue, Durgapur 713 209, India, Tel. +91 9674006999; email: arn.spark9@gmail.com

Received 24 December 2014; Accepted 8 July 2015

\textbf{ABSTRACT}

The present study illustrates the potential use of hydroxyapatite (HAp) synthesized from fish scale for Cu(II) removal with optimal efficiency. Batch experiments were conducted to determine the effects of varying parameters like contact time (40–200 min), initial metal ion concentration (100–300 mg/L), and pH (2–9). The adsorption kinetics was investigated using pseudo-first-order and pseudo-second-order kinetics. The Langmuir and Freundlich isotherm equations have been also studied for the equilibrium modeling of adsorption systems. The maximum adsorption capacity of fish scale-derived HAp on copper removal is found to be 209.732 mg/g. Box–Behnken design of response surface methodology with three variables was carried out to establish a significant correlation between the effects of these parameters to the amount of Cu(II) adsorbed. The initial Cu(II) concentration 212.93 mg/L, pH 8, and contact time 40 min are also found to be optimum for sorption of Cu(II) onto \textit{Labeo rohita} scale-derived HAp with removal efficiency of 91.77%.

\textit{Keywords:} Adsorption; Copper(II); Hydroxyapatite; \textit{Labeo rohita} scale; Optimization

*Corresponding author.

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