Environmental Engineering and Management Journal xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
http://www.eemj.icpm.tuiasi.ro/; http://www.eemj.eu

"Gheorghe Asachi" Technical University of Iasi, Romania

REMOVAL OF VANADIUM IONS FROM AQUEOUS SOLUTIONS USING DIFFERENT TYPE OF HYDROXYAPATITES: ADSORPTION ISOTHERM, KINETICS AND THERMODYNAMIC STUDIES

Inga Zinicovscaia[1,2*], Nikita Yushin[1], Daler Abdusamadzoda[1], Dmitrii Grozdov[1], Ionel Humelnicu[3], Maria Ignat[3], Doina Humelnicu[3]

[1]Department of Nuclear Physics, Joint Institute for Nuclear Research, Joliot-Curie Str. 6, Dubna, 141980, Russia
[2]Department of Nuclear Physics, Horia Hulubei National Institute for R&D in Physics and Nuclear Engineering, Bucharest - Magurele, Romania
[3]"Alexandru Ioan Cuza" University of Iasi, Faculty of Chemistry, Iasi, Romania

Abstract

Removal of vanadium(V) by hydroxyapatite and its two modifications under different pH, contact time, vanadium concentration, and temperature has been evaluated. The maximum removal of vanadium(V) ions was achieved at pH 2.0. Four kinetic models (pseudo-first-order, pseudo-second-order, Elovich, and intraparticle diffusion model) and three isotherm models (Langmuir, Freundlich, and Temkin) were used to describe the adsorption kinetics and adsorption equilibrium data. The maximum adsorption capacity was obtained for hydroxyapatite treated with Pluronic P123 (24.1 mg/g), followed by hydroxyapatite treated with Pluronic F127 (14.20 mg/g) surfactant and untreated hydroxyapatite (18.10 mg/g). The standard free energy (ΔG°), enthalpy (ΔH°), and entropy (ΔS°) were calculated to understand the nature of the adsorption process.

Keywords: adsorption, atomic absorption spectrometry, hydroxyapatite, vanadium

Received: March, 2020; Revised final: September, 2020; Accepted: October, 2020

[*] Authors to whom all correspondence should be addressed: e-mail: zinikovskaia@mail.ru; Phone: +74962165609; Fax: ++74962165089