Fabrication of modified porous starch for the removal of vanadate from aqueous solutions

Rumei Cheng⁶, Xiumei Cheng⁷, Bo Xiang⁹, Shengju Ou⁹, Yijiu Li⁹

⁶School of Ophthalmology & Optometry, Wenzhou Medical College, Institute of Advanced Materials for Nano-Bio Applications, 270 Xueyuan Road, Wenzhou 325027, China
Tel. +86 577 88067973; Fax: +86 577 88067973; email: rumeicheng@yahoo.com

⁷Bayer Technology and Engineering (Shanghai) Co., Ltd., Shanghai 200092, China

⁹Department of Chemistry, Tongji University, Shanghai 200092, China
Email: oushengju@yahoo.com

Received 14 June 2013; Accepted 24 October 2013

ABSTRACT

The dithiocarbamate-modified porous starch (DTCPS) was synthesized. It is a cheap sorbent with super adsorption ability for V(V) ions removal from aqueous solutions. Surface structure of DTCPS was confirmed by using SEM, Fourier transform infrared spectra and TGA. The DTCPS has many micropores, which favours the adsorption of V(V) ions. Adsorption results indicate that mechanism is predominately based on electrostatic attraction. The adsorption of V(V) ions on DTCPS was largely dependent on the pH value, and the optimal pH was 3.0. In such solution, the decavanadate V₁₀O₂₆(OH)₄⁻ and V₁₁O₂₇(OH)⁵⁻ are main species. They adsorbed to DTCPS following the pseudo-second-order equation and Langmuir isotherm.

Keywords: Modified porous starch; Synthesis; Characterization; Vanadate; Adsorption

*Corresponding authors.