



Investigation of Pb(II) adsorption on a novel activated carbon prepared from hazelnut husk by K₂CO₃ activation

Mustafa Imamoglu^{a,*}, Hüseyin Şahin^a, Şeyma Aydın^a, Fatmanur Tosunoğlu^a, Harun Yılmaz^b, Salih Zeki Yıldız^a

^aSciences & Arts Faculty, Chemistry Department, Sakarya University, 54187 Sakarya, Turkey, Tel. +90 264 295 60 53; Fax: +90 264 295 59 50; email: imamoglu_m@yahoo.com (M. Imamoglu), Tel. +90 264 295 67 73; email: hskimya@yahoo.com (H. Şahin), Tel. +90 264 295 61 36; email: seymaydinn@hotmail.com (Ş. Aydın), fatmanur06@windowslive.com (F. Tosunoğlu), szy@sakarya.edu.tr (S. Zeki Yıldız)

^bTechnical Sciences Vocational School, Suleyman Demirel University, Isparta, Turkey, Tel. +90 532 256 48 35; email: herunyilmaz@gmail.com

Received 3 May 2014; Accepted 26 November 2014

ABSTRACT

Hazelnut husk, an agricultural waste, was used to prepare an activated carbon (HHPCAC) by chemical activation using K₂CO₃. HHPCAC was characterized by FT-IR spectroscopy, BET surface area determination, SEM, Boehm titration, proximate, and elemental analysis. HHPCAC has a high surface area (980.9 m²g⁻¹) and contains 2.60 mmol g⁻¹ of total acidic functional groups. HHPCAC was used for the removal of Pb(II) from aqueous solutions by investigating a number of effective factors such as initial pH, contact time, dosage, and initial concentration. Adsorption of Pb(II) ions is highly dependent on pH of the solution, and its optimal value was found to be 5.0. Time to equilibrium was found as 20 h. Kinetics of Pb(II) adsorption on HHPCAC followed pseudo-second-order model. Adsorption equilibrium data were analyzed by Langmuir and Freundlich models. Maximum adsorption capacity of HHPCAC for Pb(II) was calculated as 109.9 mg g⁻¹ using Langmuir equation. From the findings, it could be concluded that HHPCAC is a feasible adsorbent for the removal of Pb(II) ions from aqueous solutions.

Keywords: Adsorption; Removal; Activated carbon; Hazelnut husk; Lead; Agricultural wastes

*Corresponding author.