

Adsorption of Pb(II) and Phenol from Wastewater Using Silver Nitrate Modified Activated Carbon from Groundnut (*Arachis hypogaea* L.) Shells

Omodele A. A. Eletta ^a, Ibrahim O. Tijani ^b, and Joshua O. Ighalo ^{c,Ψ}

Department of Chemical Engineering, Faculty of Engineering and Technology, University of Ilorin, Ilorin, P. M. B. 1515, Nigeria.

^aEmail: modeletta@unilorin.edu.ng

^bEmail: ibrahimolaniyi21@gmail.com

^cEmail: oshea.ighalo@yahoo.com

^Ψ Corresponding Author

(Received 17 February 2020; Revised 06 July 2020; Accepted 20 July 2020)

Abstract: This study was to remove Pb(II) and phenol from pharmaceutical wastewater using activated carbon derived from Silver nitrate modified groundnut (*Arachis hypogaea* L.) shells. The adsorbents were characterised by Fourier transform infrared spectroscopy (FTIR), scanning electron microscope (SEM) and X-ray Diffraction (XRD) analysis. The levels of Pb(II) and phenol in the effluent evaluated were 0.2 ppm and 3.7 ppm which were above the WHO standard. The optimal factors for Pb(II) and phenol removal by modified ground-nut shell activated carbon (MGSAC) were 176 minutes, 1.0 g/L adsorbent dosage, 35°C and pH of 6.5. The numerical optimisation revealed that the optimal removal efficiency for Pb(II) and phenol adsorption are 99.6% and 99.4% respectively for MGSAC. The adsorption of both Pb(II) and phenol was best fit to Langmuir isotherm and pseudo-second order kinetic models. The monolayer adsorption capacity of the modified adsorbent for Pb(II) and phenol were 123.2 mg/g and 115.5 mg/g respectively. The adsorption process for both Pb(II) and phenol was exothermic and spontaneous.

Keywords: Adsorption, Activated carbon, Groundnut shell, Lead, Phenol, Environment