3rd International Engineering Conference (IEC 2019)
Federal University of Technology, Minna, Nigeria

OPTIMISATION STUDY ON THE REMOVAL Pb(II), Cd(II) and Ni(II) FROM PHARMACEUTICAL WASTEWATER USING CARBONIZED AFRICAsN GIANT SNAIL SHELL (Archachatina marginata) AS AN ADSORBENT.

Olanipekun, O.[1], Aboje, A. A[2], Auta, M[3].
[1,2,3] Department of Chemical Engineering, Federal University of Technology, P.M.B 65, Main Campus, Gidan Kwano-Minna, Niger State, Nigeria
Corresponding author email: beautyink44@yahoo.com, +2348032474456

ABSTRACT

Rapid expansion of the pharmaceutical industry resulting to increased wastewater disposal containing heavy metals calls for concern. Therefore, carbonised Archachatina marginata was used in order to understand how better the Pb(ii), Cd(ii) and Ni(ii) ion in pharmaceutical wastewater can be efficiently adsorbed. A Response Surface Method (RSM) Central Composite Design (CCD) was used to study the adsorption efficiencies of these heavy metals using DESIGN EXPERT Version 7.0.0 software. This software was used for the model fitting and also to evaluate the statistical significances of models. Batch adsorption studies was then carried out at optimum conditions. Raw sample was analysed using the X-ray Fluorescence (XRF) Spectrometry to contain 54.565 % CaO, 1.35 % SiO_2 and 0.67 % Al_2O_3 among others. It was also subjected to Thermo-Gravimetric Analysis (TGA) to establish its thermal response before the production of activated carbon. Brunauer Emmet Teller (BET) analysis carried out on carbonised samples revealed an increasing surface area and pore volume with increase in temperature causing irregular pore sizing. Pharmaceutical wastewater was analysed using the Flame atomisation adsorption spectrometry (AAS) to contain 0.09 mg/l Pb(ii) 0.0439 mg/l Cd(ii) and 0.1034 mg/l Ni(ii). Percentage removal of Pb(ii) and Ni(ii) increased with increase in adsorbent dosage while that of Cd(ii) decreased. Removal of all three increased with increase in temperature and time as well. Removal efficiencies of 95.44, 90.06 and 90.89 % were recorded for Pb(ii), Ni(ii) and Cd(ii) respectively. Determination coefficient (R^2) for the adsorption models of Cd, Ni and Pb are 0.9513, 0.9694 and 0.9598.