COMPETITIVE ADSORPTION OF Pb (II), Ni (II) AND Cu (II) FROM AQUEOUS SOLUTIONS ON THIOUREA SPENT GRATED COCONUT

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ABSTRACT

COMPETITIVE ADSORPTION OF Pb (II), Ni (II) AND Cu (II) FROM AQUEOUS SOLUTIONS ON THIOUREA SPENT GRATED COCONUT

The potential of thiourea spent grated coconut (TSGC) as an adsorbent for the removal of Pb^{2+}, Cu^{2+}, and Ni^{2+} ions from aqueous solutions in ternary system was investigated. The influence of pH, contact time and initial metal concentration were studied in batch experiments at room temperature (298 K). The TSGC used in this study was characterized by FTIR spectroscopy and it was found that –OH, $-NH_2$, $-COO^-$, C-O-C and C=S groups were present. Complexation was one of the main mechanisms for the removal of Pb^{2+}, Cu^{2+}, and Ni^{2+} ions as indicated by FTIR spectra. The pH_{zpc} value of the TSGC was 6.60 and the maximum adsorption for metal was found at pH 4. The adsorption was rapid at the first 5 minutes of contact, with the uptake of 72.89% for Cu^{2+} ions, 32.44% for Pb^{2+} ions and 16.19% for Ni^{2+} ions and equilibrium was attained in 60 min of agitation. Kinetic studies showed a good correlation coefficient for the pseudo second order kinetic model. Langmuir and Freundlich models were applied to describe the adsorption of Pb^{2+}, Cu^{2+}, and Ni^{2+} ions onto TSGC. Langmuir model fitted the equilibrium data for Pb^{2+} and Cu^{2+} only with $R^2 > 0.95$. The maximum adsorption capacities of Pb^{2+}, Cu^{2+}, and Ni^{2+} ions determined from initial concentrations of 0.10 to 1.00 mmol/L were 0.3155, 1.3832 and 0.2370 mmol/g respectively, and in the sequence $Cu^{2+} > Pb^{2+} > Ni^{2+}$. The heavy metal ions bound on TSGC were poorly desorbed using 0.10 M of HCl solutions. Based on FTIR spectra, isotherm and desorption studies, it can be concluded that the dominant mechanism was complexation and TSGC showed selective adsorption towards Cu^{2+} ion.

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