Synthesis of sawdust-based poly(amidoxime) ligand for heavy metals removal from wastewater

ABSTRACT

In this study, a copolymer sawdust-graft-poly(acrylonitrile) was synthesized by free-radical initiation reaction and followed by amidoximation reaction with hydroxylamine under alkaline conditions converted into the poly(amidoxime) ligand. The functional group, compositions, and morphology of the resulting synthesized ligand and copolymer were identified by Fourier transform infrared spectroscopy, scanning electron microscopy and elemental analysis. The poly(amidoxime) ligand was utilized for heavy metal removal from aqueous solution. The synthesized polymeric ligand demonstrated a high affinity for adsorption capacity for copper and iron was 265.5 and 270.1 mg g-1, respectively. The strong adsorption capacity for lead, zinc, and cobalt were 121.2, 161.7 and 165.4 mg g-1, respectively. The adsorption data was excellently expressed by the Langmuir isotherm model (R2 >0.98) rather than Freundlich. It is suggesting that the surface of ligand is monolayer and homogeneous. The kinetic data have been determined by the first and second order. However, pseudo-second-order rate equation was well fit to the presented data. In wastewater purification process, poly(amidoxime) ligand was well removal multiple metal ions that present in the wastewater and the efficiency of removal was reached to 98.78% for copper and 99.14% iron and 90.92% for lead and 92.73% for zinc.