

Utilisation of rubber wood shavings for the removal of Cu(II) and Ni(II) from aqueous solution

Abstract

The potential of heat and chemically treated rubber wood shavings (RWS) to remove Cu (II) and Ni(II) was evaluated at bench-scale by varying parameters such as initial Cu(II) and Ni(II) concentrations, contact time and adsorbent dosage. Maximum Cu(II) and Ni(II) uptake was achieved using NaOH-treated RWS after 5 h of contact time, pH 5.0 (Cu), 5.5 (Ni) and 6.0 (mixed-metal solution), initial Cu(II) and Ni(II) of 100 mg L⁻¹ and RWS dosage of 0.3% (w/v). Point of zero charge (pHPZC) value of 4.35 suggests the appropriateness of pH range used. Higher Cu(II) and Ni(II) adsorption following NaOH treatment was due to smaller average pore diameter (34.63 Å), higher mesopore content and higher surface negativity charge. EDAX analysis confirmed the presence of Cu and Ni on the surface of the RWS. The importance of carboxyl and hydroxyl functional groups during Cu(II) and Ni(II) removal is supported by the FTIR analysis and good correlation (R^2 of 0.96–0.99) with the pseudo-second order adsorption kinetic model. The results indicate the potential of using RWS as an alternative adsorbent to remove Cu(II) and Ni(II) from industrial wastewaters.