

Recovery of gold(III) from an aqueous solution onto a durio zibethinus husk

Abstract

The recovery of gold(III) ions from an aqueous solution onto a durio zibethinus husk (DZH) was examined after varying pH, contact time, adsorbent dosage, initial Au(III) concentration, and temperature. The functional groups of DZH were analyzed by FTIR and Au(III) recovery onto DZH was verified by FESEM–EDX and XRD analysis. Adsorption equilibrium isotherms and kinetics of the DZH were studied using Freundlich and Langmuir models, as well as pseudo first-order, second-order kinetic and intraparticle diffusion equations. The experimental data obtained with DZH fitted best to the Langmuir isotherm model and exhibited a maximum adsorption capacity (q_{\max}) of 1724 $\mu\text{mol g}^{-1}$. The data followed the pseudo second-order equation. The activation energy of the adsorption (E_a) was estimated to be 38.5 kJ mol^{-1} . Thermodynamic parameters, such as changes in enthalpy, entropy and Gibbs free energy, showed that the adsorption is exothermic, spontaneous at low temperature, and is a chemisorption process. These results indicate that DZH adsorbs efficiently and could be used as a low-cost alternative for the adsorption of Au(III) in wastewater treatment.