

Sorption of Cu(II) by poly(Hydroxamic Acid) chelating exchanger prepared from polymethyl acrylate grafted oil palm empty fruit bunch (OPEFB)

ABSTRACT

This paper describes the preparation of chemically modified oil palm empty fruit bunch (OPEFB) with hydroxamic acid functional group and its use for the sorption of Cu(II) from aqueous solution. OPEFB was grafted with poly(methylacrylate) (PMA), using H₂O₂/Fe²⁺ as initiator. The PMA grafted OPEFB (PMA-OPEFB) was treated with hydroxylammonium chloride in alkaline medium to produce hydroxamic acid grafted fiber (PHA-OPEFB). The FTIR spectrum of OPEFB grafted with PMA showed an intense absorption band at 1734 cm⁻¹ which is attributed to C=O vibration in the grafted ester. After hydroxylamine treatment, the intensity of absorption band at 1734 cm⁻¹ decreased and new bands appeared at the 1640 cm⁻¹ related to C=O vibration in hydroxamic acid and at the 1568 cm⁻¹ related to the N-H amide. Sorption of Cu(II) by PHA-OPEFB was effective over a pH range of 4 to 6. The sorption followed the Langmuir model with maximum capacities of 74.1 mg g⁻¹ at 25 °C. The sorption process was exothermic, as shown by the negative value of enthalpy change, ΔH° . The free energy change (ΔG°) for the sorption was negative, showing that the sorption process was spontaneous. A kinetic study showed that the Cu(II) sorption followed a second order kinetic model.

Keyword: Methyl acrylate; Grafted; OPEFB; Hydroxamic acid; Cu(II); Sorption