

## **Toxic Metal Ions Removal from Electroplating Wastewater Using Polymer Chelating Ligands**

### **ABSTRACT**

Background: Empty fruit bunch (EFB) is a type of biomass waste product formed during the production process of palm oil. In the present work, EFB was used to prepare a cellulose-graftcopolymer which can be converted into poly(amidoxime)-poly(hydroxamic acid) ligands suitable for the removal of heavy metals from electroplating wastewater.

Methods and Results: Poly(amidoxime)-poly(hydroxamic acid) ligands were synthesized from the poly(acrylonitrile-co-methyl acrylate) grafted palm cellulose and were analyzed via FT-IR and FESEM. The binding capacity ( $q_e$ ) with the metals ions such as copper ( $\text{Cu}^{2+}$ ), iron ( $\text{Fe}^{3+}$ ), cobalt ( $\text{Co}^{2+}$ ), nickel ( $\text{Ni}^{2+}$ ) and lead ( $\text{Pb}^{2+}$ ) were 341, 290, 284, 204 and 482 mg g<sup>-1</sup>, respectively at pH 6. The pseudo-first-order kinetic model is fitted with the results confirming heavy metal adsorption. The isotherm study was conducted using a linear plot of the Langmuir isotherm where results were significantly different from the experimental value (maximum adsorption,  $q_e$ ), indicating that adsorption does not occur on a single layer. However, the coefficient of the correlation values obtained using the Freundlich isotherm model were acceptable ( $R^2 > 0.99$ ), and it was concluded that adsorption was multilayered with some metal ions.

Conclusion: The polymeric ligands synthesized here showed excellent adsorption of heavy metals from electroplating wastewater containing a notable amount of copper and iron metal ions.