Heavy metals removal from electroplating wastewater by waste fiber-based poly(amidoxime) ligand

ABSTRACT

An efficient and economical treatment technology for heavy metal removal from the electroplating wastewaters is needed for the water purification. Therefore, pure cellulosic materials were derived from two waste fiber (pandanus fruit and durian rind) and conversion of the cellulose into the poly(acrylonitrile)-grafted material was accomplished by free radical grafting system. Thereafter, poly(amidoxime) ligand was produced from the grafted materials. Sorption capacity (qe) of several toxic metals ions was found to be high, e.g., copper capacity (qe) was 298.4 mg g−1 at pH 6. In fact, other metal ions, such as cobalt chromium and nickel also demonstrated significant sorption capacity at pH 6. Sorption mechanism played acceptable meet with pseudo second-order rate of kinetic pattern due to the satisfactory correlation with the experimental sorption values. A significant correlation coefficient (R2 > 0.99) with Langmuir model isotherm showed the single or monolayer sorption occurred on the surfaces. The reusability study showed that the polymer ligand can be useful up to six cycles with minimum loss (7%) of efficiency and can be used in the extraction of toxic metal ions present in the wastewaters. Therefore, two types of electroplating wastewater were used in this study, one containing high concentration of copper (23 ppm) and iron (32 ppm) with trace level of others heavy metals (IWS 1) and another containing high concentration of copper (85.7 ppm) only with trace level of others heavy metals (IWS 2). This polymeric ligand showed acceptable removal magnitude, up to 98% of toxic metal ions can be removed from electroplating wastewater.