

Adsorptive separation of Pb(II) and Cu(II) from aqueous solution using carboxymethylated waste Lyocell fiber

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In this study, waste Lyocell fiber was modified via carboxymethylation of its hydroxyl moieties and used for the adsorptive separation of Pb(II) and Cu(II) from aqueous solution. The maximum batch uptakes of Pb(II) and Cu(II) in single metal systems were 353.45 mg/g (1.71 mmol/g) and 98.33 mg/g (1.57 mmol/g), respectively. In a competitive binary metal system, the uptake of Cu(II) largely decreased to 38.40 mg/g (0.60 mmol/g). Thus, Pb(II) selectivity was observed at higher equilibrium concentrations in the competitive binary system. Characterization tests indicated that ion exchange was the dominant adsorption mechanism. When the adsorbent was applied in flow-through column, adsorption followed by desorption aided in effectively eluting ~260 mg of Pb(II) (out of ~300 mg total adsorbed) from the Pb(II)-Cu(II) binary solution. Four successive cycles of batch adsorption-desorptions were performed without significant drop in uptake. This study may provide an alternative waste fiber recycling option and may be useful in recovering heavy metal ions from aqueous sources to complement their depleting reserves