



## Heavy metal removal from aqueous solution by tannins immobilized on collagen

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### ABSTRACT

Different recycled materials, which were derived from leather manufacturing processes, were used as adsorbents for the treatment of synthetic wastewater containing heavy metal ions. Three pelt scraps samples (P-M, P-Z and P-P), one shaving scrap (S) and one trimming scrap (T) were used as recycled adsorbents. Removal efficiency of Cu(II), Cd(II), Zn(II), Pb(II) and Cr(III) was evaluated by a laboratory-scale batch reactor at different solution pH. For all adsorbents except T sample, the adsorption of heavy metal ions begins between pH 2 and 4 and reaches near complete adsorption within the next 3–4 pH units, showing a typical cationic-type of adsorption. Removal trend of Cr(III) was quite similar without depending on the kind of adsorbents. From the kinetic experiments of Cu(II) by S adsorbent, adsorption of Cu(II) was better described by second-order reaction than first-order reaction. The initial removal rate of Cu(II) by S adsorbent was 7143 mg/kg·h. Adsorption isotherm of Cu(II) onto S adsorbent was well expressed by Langmuir equation and the maximum adsorption capacity of Cu(II) at pH 4 was calculated as 1667 mg/kg.

*Keywords:* Adsorption; Collagen; Heavy metal; Leather waste; Recycle; Tannin

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