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Biosorption of Heavy Metals by Low Cost Adsorbents

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Abstract : This paper describes the use of by-products as adsorbents for removing heavy metals from aqueous effluent solutions. Products of almond skin, walnut shell, saw dust, rice bran and egg shell were evaluated as metal ion adsorbents in aqueous solutions. A comparative study was done with commercial adsorbents like ion exchange resins and activated carbon too. Batch experiments were investigated to determine the affinity of all of biomasses for, Cd(II), Cr(III), Ni(II), and Pb(II) metal ions at pH 5. The rate of metal ion removal in the synthetic wastewater by the biomass was evaluated by measuring final concentration of synthetic wastewater. At a concentration of metal ion (50 mg/L), egg shell adsorbed high levels (98.6 – 99.7%) of Pb(II) and Cr(III) and walnut shell adsorbed high levels (35.3 – 65.4%) of Ni(II) and Cd(II). In this study, it has been shown that by-products were excellent adsorbents for removal of toxic ions from wastewater with efficiency comparable to commercially available adsorbents, but at a reduced cost. Also statistical studies using Independent Sample t Test and ANOVA Oneway for statistical comparison between various elements adsorption showed that there isn't a significant difference in some elements adsorption percentage by by-products and commercial adsorbents.

Keywords : adsorbents, heavy metals, commercial adsorbents, wastewater, by-products
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