

[Keynote Talk]: Uptake of Co(II) Ions from Aqueous Solutions by Low-Cost Biopolymers and Their Hybrid

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Abstract : Alginate hydrogel beads (AB), spent peppermint leaf (PM), and a hybrid adsorbent of these two materials (ABPM) were studied as potential biosorbents of Cobalt (II) ions from aqueous solutions. Cobalt ion is a commonly underestimated pollutant that is responsible for several health problems. Discontinuous batch experiments were conducted at room temperature to evaluate the effect of solution acidity, mass of adsorbent on the adsorption of Co(II) ions. The interfering effect of salinity, the presence of surfactants, an organic dye, and Pb(II) ions were also studied to resemble the application of these adsorbents in real wastewater. Equilibrium results indicate that Co(II) uptake is maximized at pH values higher than 5, with adsorbent doses of 200 mg, 200 mg, and 120 mg for AB, PM, and ABPM, respectively. Co(II) adsorption followed the trend AB > ABPM > PM with Adsorption percentages of 77%, 71% and 64%, respectively. Salts had a strong negative effect on the adsorption due to the increase of the ionic strength and the competition for adsorption sites. The presence of Pb(II) ions, surfactant, and dye BY57 had a slightly negative effect on the adsorption, apparently due to their interaction with different adsorption sites that do not interfere with the removal of Co(II). A polar-electrostatic adsorption mechanism is proposed based on the experimental results. Scanning electron microscopy indicates that adsorbent has appropriate morphological and textural properties, and also that ABPM encapsulated most of the PM inside of the hydrogel beads. These experimental results revealed that AB, PM, and ABPM are promising adsorbents for the elimination of Co(II) ions from aqueous solutions under different experimental conditions. These biopolymers are proposed as eco-friendly alternatives for the removal of heavy metal ions at lower costs than the conventional techniques.

Keywords : adsorption, Co(II) ions, alginate hydrogel beads, spent peppermint leaf, pH

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