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Thermodynamic feasibility of Mn (II), Fe (II) and Pb (II) ions exchange in aqueous medium by red onion (*Allium Cepa*) skin extract resin

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Abstract : Feasibility studies on the thermodynamics of Mn^{2+}, Fe^{2+} and Pb^{2+} ions exchange in aqueous medium by carboxylated-epichlorohydrin red onion skin extract resin (CERR) was undertaken. The acetone extract of red onion skin was used in the synthesis of CERR. Maximum ion exchange capacities of 3.050×10^{-5}, 2.804×10^{-5} and 6.404×10^{-6} mol/g for Mn^{2+}, Fe^{2+} and Pb^{2+} ions respectively were obtained with 0.04g/L metal ions concentration at 29°C. The trend ($Mn^{2+} > Fe^{2+} > Pb^{2+}$) of the ion exchange capacity of CERR for the metal ions is in conformity with that of their ionic radii. The experimental exchange capacity of the ions was analyzed with Langmuir, Freundlich and Temkin isotherm models at different temperatures and concentrations. The regression analysis of the models was found to closely fit the experimental data in the order: Freundlich > Langmuir > Temkin. An assessment of the thermodynamics of the exchange reaction revealed values for the change in enthalpy, ΔH, Gibbs free energy, ΔG, and entropy, ΔS; which reflected the process spontaneity, exothermic nature and feasible affinity of the interacting metal ions at the exchange sites.

Keywords : Thermodynamics, Red onion skin, Ion exchange capacity, Metal ions, Resin, Isotherm models.

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