Adsorption of Copper, Zinc and Nickel Ions from Single and Binary Metal Ion Mixtures on to Chicken Feathers

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ABSTRACT: Certain industries often produce mixtures of heavy metal ions in their waste products. Because of the nature of heavy metal ions and the adsorption process, such metal ions can compete with each other for the sorption sites on an adsorbent during adsorption processes. In the present work, binary systems composed of copper, zinc and nickel ions were selected as examples of heavy metal ion mixtures and tested via batch adsorption processes using chicken feathers as an adsorbent. The uptake of individual metal ions was depressed by the presence of another. Thus, the uptake of copper ions from an initial copper ion solution of 20 ppm concentration was reduced from 0.042 mmol/g to ca. 0.019 mmol/g by the presence of a similar concentration of nickel ions. The Freundlich, Langmuir and Sips multi-component adsorption models were employed to predict the uptake of metal ions from binary metal ion solutions using constants obtained from adsorption isotherm models applied to single-solute systems.