Removal of cobalt from aqueous solution using xanthate functionalized dendrimer

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ABSTRACT
Removal of cobalt from aqueous solution by indigenously synthesized xanthate functionalized dendrimer (XFD) was investigated. Effect of pH and interference due to complexing agents/other cations on removal of cobalt by precipitation method was studied. Loading capacity of XFD as a function of cobalt concentration was estimated; about 0.355 g of cobalt could be loaded per gram of XFD at pH 4.5. It was observed that quantitative precipitation is effective at pH > 3 and the suspended particles are not settling down when the pH of feed solution is more than 6. The suspended particles settle down by the addition of coagulating agent (aluminum sulfate). The presence of Sr²⁺ or Mg²⁺ cations enhances precipitation process whereas monovalent Na⁺ ion has no significant effect on cobalt removal by XFD ligand. Toxicity characteristics leaching procedure and semi-dynamic leaching test results show that Co-XFD complex is a characteristic leaching toxic and needs further treatment before dumping into the sanitary landfills.

Keywords: Cobalt; Dendrimer; Xanthate; Precipitation; Coagulating agent

1. Introduction
Heavy metal contamination exists in aqueous waste stream of many industries such as metal plating facilities, mining operations, nuclear industry, and tanneries. Most of the heavy metals are potentially hazardous to living systems, and limits have been placed on their concentrations in potable water supplies and effluent discharges by different control agencies throughout the world [1,2]. Vast applications of cobalt in various arrays of products and processes such as alloys, batteries, catalysts, pigments, and coloring make this element as an important metal in various industries [3]. Cobalt is beneficial for human because it is a part of vitamin B₁₂, which is an essential biomolecule for human health. Among the heavy metal pollutants, cobalt is one of the most widespread contaminants in the environment. The presence of Co(II) metal ion in the environment is of important concern due to its toxicity and health effects on human. It can cause neuron toxicological disorders.

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