Synthesis and Characterization of Some Resins to Separate Some Radioactive Elements from Egyptian Monazite

A thesis Submitted

By

Ahmed Ragaa Abd El-Hay Elsalamouny

For

The Degree of Doctor of Philosophy in Chemistry

To

Chemistry Department
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ABSTRACT

Some synthetic sorbents were successfully prepared using different methods for separation and removal of some elements namely; U^{6+}, Th^{4+} and Nd^{3+} from aqueous solutions.

The chelating organic material such as fumaric acid can be copolymerized with an inert polymeric support like polystyrene to form fumarated polystyrene microspheres as a novel chelating polymeric resin. Also, another chelating polymeric material was prepared using the chelating properties of diethanolamine (DEA) to make a chemical modification for novolac resin. Finally, a direct reaction was employed for fully substitution of hydrogen atoms of amino groups on chitosan by methylene phosphonic groups under drastic conditions. Abundant of methylene groups increases the hydrophobic property of modified chitosan and leads to its insolubility under a wide pH range. This resin was applied as a novel sorbent for metal ions removal using batch processes.

The performance of these synthetic sorbents in metal ions removal was assessed by studying the effect of different conditions on the distribution of these metal ions between solid and liquid phases. The effect of contact time on the removal process was studied and kinetic models were deduced to describe this effect. Finally, the stabilization of contaminants on the synthetic resin under different initial contaminant concentrations was studied by analyzing equilibrium isotherms data. These studies were dedicated to separate metal ions under study from Egyptian monazite mineral using one of these synthetic sorbents.

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AIM OF THE WORK

This work is directed to prepare suitable synthetic sorbents for separation and removal of some elements namely; U^{6+}, Th^{4+} and Nd^{3+} from aqueous solutions.

The following procedures are required for accomplish this work: Preparation and characterization of the synthetic resins that are used in separation of the chosen elements; Study efficiency of the synthetic resins that are used in separation of the chosen elements from pure samples and in presence of related interferences; Evaluation of some thermodynamic parameters like ΔG, ΔH and ΔS and kinetics of experimental results; Study efficiency of the synthetic resins that are used in separation of the chosen elements from real samples; Compare the obtained results statistically with the reference results that were published.