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Reusable Chelating Resins Concentrate Metal Ions from Highly Dilute Solutions

The problem:

To devise a simple method of recovering heavy-metal ions from highly dilute solutions. The recovery of trace amounts of dissolved metals is an important problem in analytical chemistry, hydrogeochemical prospecting, and in the clinical treatment of victims of heavy-metal poisoning.

The solution:

A column chromatographic method using new metal chelating resins which are simply prepared from commercially available chemicals.

How it's done:

The chelating resins are prepared by linking benzidine to carboxymethylcellulose and then coupling a metal chelating agent such as dithizone (3-mercapto-1, 5 diphenylformazan) or oxine to the benzidine group. Small columns containing the powdered chelating resins are used for chromatographic extraction of heavy-metal (cobalt, nickel, copper, silver, lead, etc.) cations from highly dilute solutions (individual cation concentrations of approximately 100 ppm). The pH of a given solution must be appropriately adjusted to ensure quantitative or semiquantitative extraction of different heavy-metal cations.

Notes:

1. The absorbed cations may be removed from the chelating resins by acid or base washes. The resins are reusable after the washes are completed.

2. The dithizone cellulose resin is olive green at a pH in the range of 2 to 8, purple in strong acids, and orange in basic solutions. It readily reacts with heavy-metal cations, changing usually to some shade of red or orange, depending on the specific metal extracted from solution. This new resin has been found useful for the qualitative and semi-quantitative analysis of heavy-metal cations in highly dilute solutions, using either column or paper chromatography.
3. These chelating resins show promise for use in the isolation of trace metals from sea water, analytical chemistry, and biochemistry.
4. Any polymer capable of diazotization, such as polyaminopolystyrene may be used as a backbone to carry the chelating groups.
5. Inquiries concerning this invention may be directed to:

Technology Utilization Officer
Jet Propulsion Laboratory
4800 Oak Grove Drive
Pasadena, California 91103
Reference: B66-10451

Patent status:

Inquiries about obtaining rights for the commercial use of this invention may be made to NASA, Code GP, Washington, D.C. 20546.

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