Extraction of Gadolinium with Liquid Ion-Exchangers

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Extraktion von Gadolinium mit Hilfe von flüssigen Ionenaustauschern

A simple method is developed for the extraction and separation of gadolinium(III) with liquid ion-exchangers such as tri-n-octylamine (TOA) and tri-iso-octylamine (TIOA) dissolved in benzene as extractants. The method provides for the separation and determination of gadolinium(III) from binary mixtures as well as from multicomponent mixtures. The log-log plot of distribution ratio versus amine concentration (at fixed pH and sodium succinate concentration) and sodium succinate concentration (at fixed pH and amine concentration) gave a slope of one indicating the metal to succinate and metal to amine ratio of 1:1 in the extracted species.

2500 µg each of chloride, sulphate, nitrate, carbonate and phosphate; 1000 µg each of Cu(II), Cd(II), Ag(I), Au(III), Os(VIII), Cr(VI), V(V), Pb(II), Bi(III), tartrate, thiocyanate and thiourea; 500 µg each of U(VI), Zn(II), Ni(II), Co(II), Ti(IV), oxalate and fluoride; 250 µg each of Dy(III), Pd(II) and Pt(IV)

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and 100 µg each of Mn(II) and Sn(II) do not interfere in the extraction and determination of gadolinium(III) by the proposed method. However, notable interference is found from Y(III), citrate and ascorbate. The method permits extraction and determination of Gd from multicomponent mixtures containing ions such as Cu(1000 µg), Au(1000 µg) and Pb(1000 µg); Pd(200 µg), Pt(200 µg) and Os(500 µg); U(500 µg) and Dy(250 µg). The recovery of Gd(III) from binary as well as from multicomponent systems was found to be greater than 99 %. The standard deviation and coefficient of variation was found to be 1.55×10^{-2} and 5.16 % for 50 µg of Gd. Thus the method is precise.

Working Procedure. Take 25 to 100 µg of gadolinium(III), add 0.067 g to 1.004 g of sodium succinate (0.01 M to 0.15 M), adjust the pH to 10.5 to 11 (with HNO₃/NaOH) in a total volume of 25 ml and extract it with two 5 ml portions of either 5 % TOA or TIOA dissolved in benzene. From the organic phase backextract gadolinium with two 5 ml portions of 0.1 M perchloric acid. Equilibrate the combined aqueous phase with 5 ml of benzene to remove dissolved amine and estimate gadolinium as follows: Add 1 ml of 0.1 % aqueous arsenazo I solution, adjust the pH to 6 (with HNO₃/NaOH) and make the volume 25 ml with distilled water. Read the absorbance of the red-violet complex formed at 570 nm against a reagent blank prepared analogously.

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Erratum

Determination of Mercury in Seawater by Cold Vapour Atomic Absorption Spectrophotometry

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We regret that two erroneous data have been given in the paper for the flow rates of nitrogen: On page 201, second column, last line on the page, the numerical value should read correctly $250 \text{ ml} \cdot \text{min}^{-1}$ (instead of $40 \text{ ml} \cdot \text{s}^{-1}$); on page 202, first column, 7th line of the text, the value should read $500 \text{ ml} \cdot \text{min}^{-1}$ (instead of $90 \text{ ml} \cdot \text{s}^{-1}$).

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