Separation of a Trace Amount of Cesium from Large Amounts of Potassium or Ammonium by Coprecipitation with Thallium (I) Chloroplatinate

By Noboru YAMAGATA and Eisaku TAJIMA

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The carrier-free separation of cesium by the thallium (I) dipicrylaminate method from fission products is successful only when both potassium and ammonium ions are absent1). However, it is sometimes

TABLE I

SOLUBILITY OF ALKALI CHLOROPLATINATES IN WATER

(g. anhydrous salt per 100 g. water at 20°C)

K	0.7742
NH_4	0.5000
Rb	0.0283
Cs	0.0086
Tl (I)	0.0064 (15°C)

TABLE II

SEPARATION OF CESIUM-137 FROM POTASSIUM AND AMMONIUM

(at room temperature)

Solution (30ml.)	Thallium (I) added mg.	Chloroplatinic** acid added ml.	Cesium-137 coprecipitated
0.3 N KCl	20	1	54.0
0.1 N KCl	20	1	79.1
0.1 N KCl	20	1.5	81.4
0.1 N KCl	40	2	81.0
0.03 N KCl	40	2	83.1
0.1 N KCl*	20	1.5	77.1
0.3 N KNO_3	20	1.5	57.9
0.3 N KNO_3	40	1	47.0
0.1 N KNO_3	20	1.5	82.0
0.1 N KNO_3	20	1.5	82.0
0.1 N KNO_3	10	0.75	51.3
0.1 N KNO_3	5	0.38	19.0
0.3 N NH_4Cl	20	1	71.0
0.1 N NH_4Cl	20	1	78.9

* 5 μg. of cesium added.

** 5% aqueous solution.

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1) This Bulletin, 30, 580 (1957).

required to separate a trace amount of cesium from a large amount of these ions, especially from potassium.

The solubility of chloroplatinates of alkali metals and thallium (I) in water, as shown in Table I[2], indicates the possibility of the coprecipitation of a small amount of cesium with thallium (I) chloroplatinate in the presence of a large amount of potassium or ammonium ions.

A tracer experiment by the use of cesium-137 was performed to confirm this presumption; the procedure is the same as descrived in the previous report[3]. The results are shown in Table II; carrier-free cesium-137 or a microgram quantity of cesium can be separated from about 0.1 g. potassium in chloride or nitrate solution with a yield of about 80%. As the solubility of thallium (I) chloride is comparatively greater (0.29 g./100 g. water at 15.6°C)[4] than that of thallium (I) chloroplatinate, the formation of the precipitate of the latter is not interfered with by the presence of a large amount of chloride ions.

The precipitated thallium (I) chloroplatinate is dissolved in hot hydrochloric acid containing chlorine. The resulting solution, after being boiled to expel excess of chlorine, is made 2 N hydrochloric acid and passed through an anion-exchanger column (Dowex 1, X-8, ϕ 5×50 mm.). The effluent, free from thallium (III) and platinum (IV), contains 100% of the coprecipitated cesium and only a trace of potassium.

Kiriu College of Technology
Gumma University, Kiriu

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[2] A. Seidell, "Solubility of inorganic and metal organic compounds", New York, (1940) p. 456, 1086, 1424, 1434.

[3] This Bulletin, **30**, 577 (1957).

[4] "Gmelin's Handbuch der anorganischen Chemie" Thallium, p. 273.