

*The Preparation of Carrier-free $^{234}\text{Th}(\text{UX}^1)$
by Anion Exchange from Nitric Acid-Alcohol
Mixed Solution of Uranyl Nitrate*

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The preparation of thorium-234 by solvent extraction¹⁻⁶⁾ and ion exchange⁷⁻¹⁰⁾ from uranyl nitrate have been reported by many

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workers. In nitric acid medium, thorium-234 was separated by anion exchanger Amberlite IRA-400¹¹⁾. Recently, Korkisch et al.¹²⁾ reported that the adsorption of thorium onto anion-exchange resin is very strong, but that of uranium is rather weak, in a nitric acid-alcohol mixed solution.

The author studied the procedure of the preparation of carrier-free thorium-234 using an anion exchanger Dowex 1-X8. The preparation procedure is as follows. One gram of commercial reagent grade uranyl nitrate hexahydrate crystal was dissolved without further purification in 5~6 ml. of 0.2 N nitric acid-ethyl alcohol 80%, mixed solution*, and the solution was passed through Dowex 1-X8 resin column (100~200 mesh, 1.0 g., 0.70 cm² × 2.8 cm., pretreated with a few milliliters of the nitric acid-alcohol mixed solution) at a flow rate 0.7 ml. per min., and then the column was washed with 30~40 ml. of the nitric acid-alcohol mixed solution. The elution of thorium from the resin column could be attained with a small amount of 0.2 N nitric acid or water. When the elution was carried out with 0.2 N nitric acid, thorium was almost completely eluted with 4~5 column volumes of the nitric acid solution at a flow rate 1.0 ml. per min.

The result shown in Fig. 1 was obtained using the procedure described above. The activity measurement of the solution was as follows; an aliquot of the solution was transferred to a glass counting dish, and evaporated to dryness. The α and β activities were counted using a gas flow proportional counter and G-M counter respectively. In Fig. 2, decay curve of the eluate is shown.

The yield of thorium-234 from one gram of

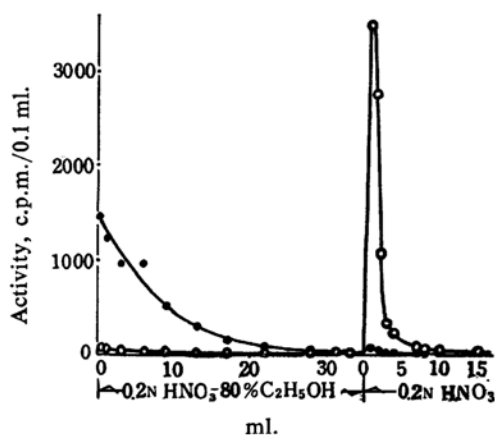


Fig. 1. Elution curve of thorium-234.

••: α -activity, ○○: β -activity

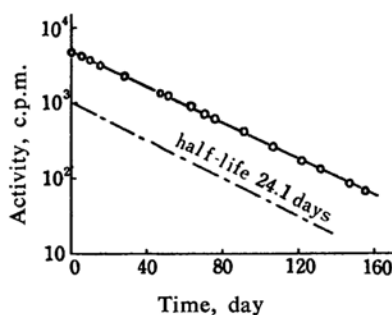


Fig. 2. Decay curve.

uranyl nitrate crystal was 4.6×10^5 d.p.m. ($^{234}\text{Th} + ^{234}\text{Pa}$), and the radiochemical impurities were not observed by β and γ energy measurements.

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* For example, 2 ml. 1 N HNO_3 + 8 ml. 99.5 vol. % $\text{C}_2\text{H}_5\text{OH}$.