

Preparation of Carrier-Free Yttrium-90

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Yttrium-90 has been used as a suitable nuclide for various tracer experiments because its half life of about sixty-four hours is of a length convenient for experimental purposes, because it is a pure beta emitter which decays to a stable zirconium-90, and because it is obtained repeatedly by "milking" it at desired intervals from its long-lived parent, strontium-90 (19.9 years half-life).

Although carrier-free yttrium-90 has been separated from strontium-90 by radiocolloidal formation of the yttrium in basic solution¹⁾, by ion exchange²⁾, by electrochromatographic method³⁾, by solvent extraction⁴⁾, by mass spectrometric method⁵⁾, by vacuum evaporation⁶⁾, by co-precipitation with iron (III) hydroxide⁷⁾, and by precipitation of strontium-90 with strontium nitrate carrier in 80% nitric acid⁸⁾, the authors have found that carrier-free yttrium-90 can be separated rapidly and simply by paper chromatographic method, using a solvent consisting of 5 parts of ethyl alcohol, 5 parts of butyl alcohol, and 2 parts of 10% ammonium thiocyanate solution⁹⁾.

Several drops of the strontium nitrate solution containing strontium-90 and yttrium-90 were placed on the pencilled line situated at 3 cm. from one edge of the strip of the filter paper (Toyo No. 3, 2×40 cm.). The spots were allowed to dry in the air and then developed chromatographically with the

above-mentioned solvent. After the development, the paper strip was dried and cut off at an interval of 1 cm. Each piece of the paper strip was placed at the center of a sample pan and its radioactivity was measured by a Geiger-Mueller counter.

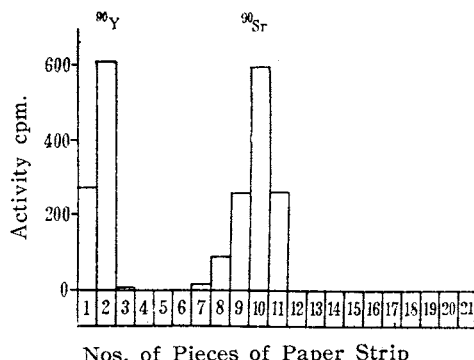


Fig. 1. Chromatogram of ^{90}Y and ^{90}Sr .

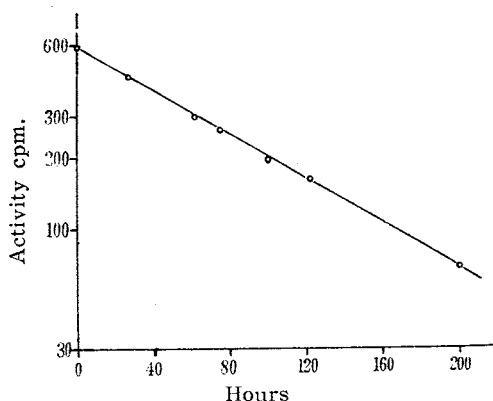


Fig. 2. Decay of ^{90}Y Separated.

One example of the results obtained is shown in Fig. 1. The strontium-90 with carrier had an R_f value of about 0.5 and the carrier-free yttrium-90 was located at the original position, that was in the middle of the pieces No. 1 and No. 2. The solvent front was the upper edge of the piece, No. 21. The radioactivity of the piece No. 2 decreased as shown in Fig. 2. From Fig. 2 the half life of the yttrium-90 was calculated as sixty-three hours.

Full details will be reported later.

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