

atmospheric pressure. In order to confirm whether or not such a low-temperature sublimation is characteristic of dithizonate, the volatility of other polonium compounds was studied. The compounds investigated were those which are extractable with organic solvents. They are divided into two groups according to their chemical species.

Group I: The compounds resulting from the interaction of polonium with organic reagents. The organic reagents used for this study are as follows: 8-hydroxyquinoline, sodium diethyl-dithiocarbamate, thenoyltrifluoroacetone, thiourea, *sym*-diphenylthiourea, thiosemicarbazide, 1-phenylthiosemicarbazide, diphenylcarbazone, diphenylcarbazine, diphenylthiocarbazine and di- $\beta$ -naphthylthiocarbazine.

Group II: The polonium compounds which are extracted in the absence of organic reagents;

(a) polonium compound which is extracted with *iso*-propyl ether from an aqueous solution of 0.5 M potassium iodide and 3 N hydrochloric acid<sup>2)</sup>.

(b) polonium compound which is extracted with methyl *iso*-butyl ketone from an aqueous solution of 0.5 M potassium iodide and 1.5 N hydrochloric acid<sup>2)</sup>.

The samples were mounted in stainless steel dishes and the heating was carried out on a hot plate. The measurement of polonium activity was made with a Lauritsen electroscope.

The results of the experiment are summarized below;

1) All polonium compounds of Group I sublime below 160°C/1 atm., while no sublimation is observed even at 200°C/1 atm. for the compounds of Group II.

(2) The volatility of the polonium compounds with organic reagents of a similar type tends to decrease in the following order.

thiourea > *sym*-diphenylthiourea.  
diphenylcarbazone, diphenylcarbazine  
> diphenylthiocarbazine > di- $\beta$ -naphthylthiocarbazine.

(3) The volatility is remarkable for the compounds with diphenylcarbazone, diphenylcarbazine and diphenylthiocarbazine. Above all, the compounds with the first two reagents sublime below 100°C/1 atm.

From the results mentioned above, it follows that the low-temperature sublima-

### *On the Volatility of Polonium Compounds*

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As reported before<sup>1)</sup>, polonium dithizonate sublimes at about 120°C under

1) K. Kimura and H. Mabuchi, This Bulletin, 28, 535, (1955).

2) K. Kimura, N. Saito, Y. Koda and K. Tanaka, paper presented before the 29th Annual Meeting of the Chemical Society of Japan (1956).

tion is not characteristic of polonium dithizonate, but common to many organo-compounds of polonium.

As an application of this property of polonium organo-compounds to radiochemical analysis, the carrier-free separation of radium-F (polonium) from radium-D (lead) and radium-E (bismuth) was carried out by distillation of polonium compounds with diphenylcarbazide. The most effective procedure for distillation is as follows.

Fifty milliliters of nitric acid solution of radium-D, -E, -F mixture is taken in an all-glass distilling apparatus. The acidity of the solution should be adjusted between 0.1 and 0.5N in nitric acid. To this solution is added 30 mg. of diphenylcarbazide. Then the distillation is carried out until one half of the initial volume of the solution is distilled. Radiochemically pure radium-F is found in the distillate. Moreover, this aqueous distillate is almost free from the excess of the organic reagent. The presence of strong oxidizing agents and the chloride ion in the initial solution decreases the efficiency of separation.

The detail of these studies will be reported in a separate paper.

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