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POLONIUM EXTRACTION USING A PLATINUM ELECTRODE AND HYDROGEN

WORK DONE BY:

R. J. Prestwood

REPORT WRITTEN BY:

R. J. Prestwood

*RP Report on Polonium Metallurgy*

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ABSTRACT

The extraction of polonium from a RaD solution on a platinum electrode in a hydrogen atmosphere has been studied. A yield of 94 percent was obtained in one hour, during which 155 mc of Po were plated out on 10 cm<sup>2</sup> of Pt. The method appears useful.

Details of the procedure and a drawing of the apparatus used are given.

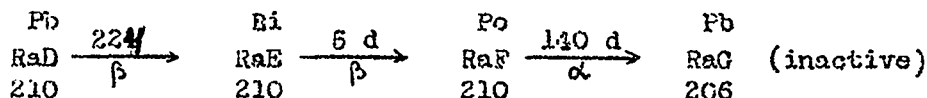


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## POLONIUM EXTRACTION USING A PLATINUM ELECTRODE AND HYDROGEN

Introduction

A purified RaD solution (LA-52) containing 500 millicuries of RaD had stood long enough for the polonium content to reach approximately 165 millicuries. To obtain this amount of Po from 500 mc of RaD requires 81 days, if one uses 140 days as the half life of Po, and provided that RaE is in equilibrium with the RaD. The series of interest is as follows:



The method used to extract the Po from the RaD solution was essentially that of O. Erbacher<sup>1)</sup> with the exception that the amount of Po and the size of the apparatus used in the present experiment were larger by a factor of ten. A sketch of the apparatus is shown in Fig. 1.

Procedure

The 500 mc of RaD and 165 mc of Po were in about 60 ml of a solution 0.1 N in HCl contained in a 100 ml quartz beaker. This was put into its proper place in the apparatus (see Fig. 1) and the Pt stirrer was kept above the solution while H<sub>2</sub> was passed into the system at a rate of 3 to 4 bubbles a second

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1) O. Erbacher, Zeitschrift für Phys. Chemie, 156-A, 142, (1931).

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as determined by a water bubble tower. The Pt stirrer was of the windmill type having 6 blades and a total area of  $10 \text{ cm}^2$ . The surface to be plated had been rubbed with emery cloth, then etched slightly in aqua regia, washed with water and dried in an oven. After the stirrer had been in the  $\text{H}_2$  atmosphere for five minutes, it was lowered into the solution. The Pt rotated in the solution at 300 to 500 rpm for one hour with the  $\text{H}_2$  flowing over the solution at the above rate. At the end of this time rotation was stopped and the electrode removed from the solution. It was washed with water, the washings being drained into the solution. Assay of the resulting solution showed 10 mc of Po left, which had not plated out. The potential of the Pt- $\text{H}_2$  electrode is such that no Pb (RaD) plates out with the Po.

This means that 165 mc of Po were plated out in one hour on  $10 \text{ cm}^2$  of Pt without introducing any impurities into the original solution or removing any of the RaD.

Our results are compared with those of Erbacher in the following table.

	Amount Removed	Percent Recovery	Density of Deposit
Erbacher after 2 hrs plating from 5 ml solution	16.2 mc	92.5 percent	12.6 mc/cm <sup>2</sup>
Present results after 1 hr plating from 60 ml solution	165 mc	94 percent	15.5 mc/cm <sup>2</sup>

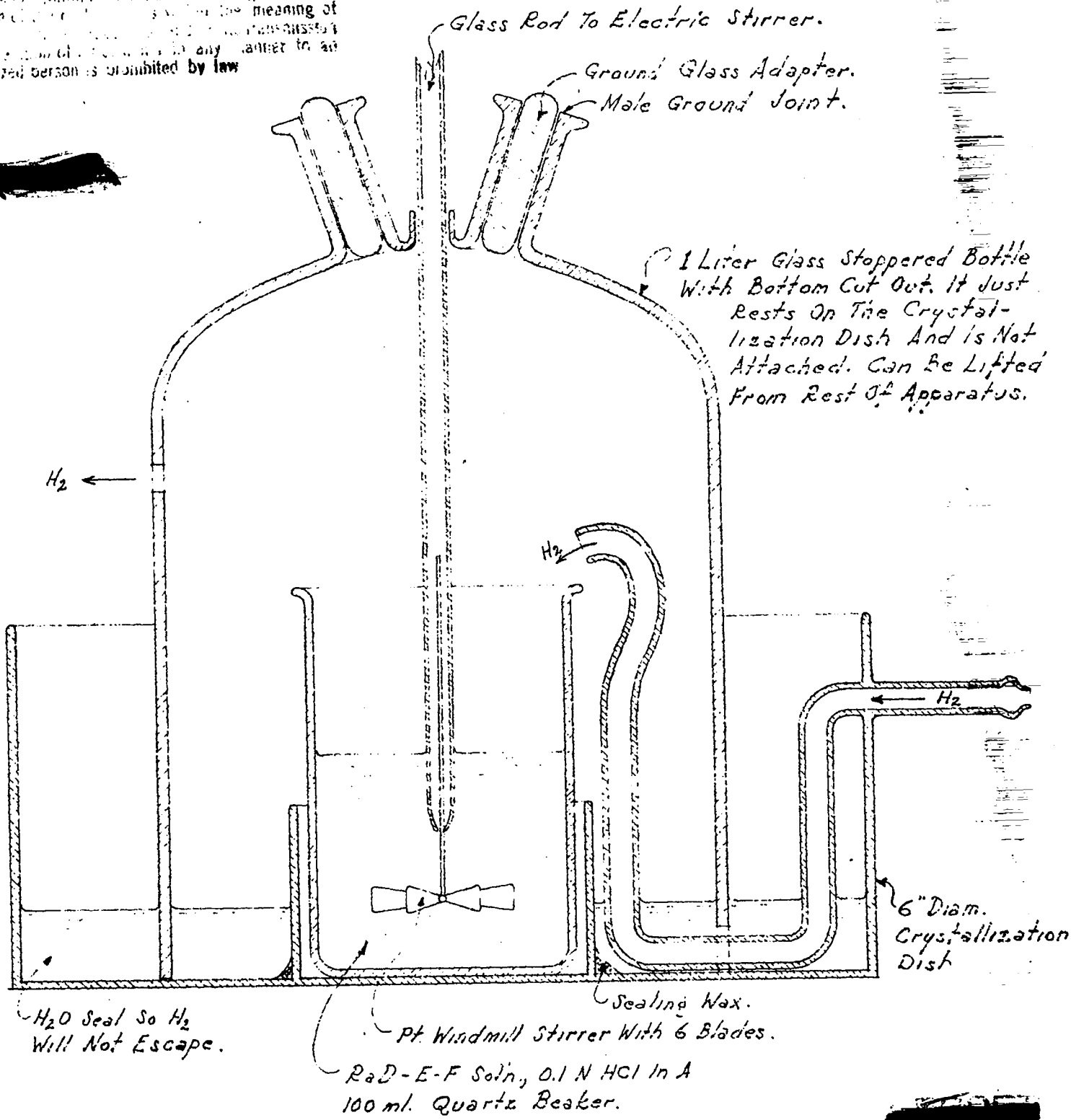
The results seem consistent except that plating is more rapid in Erbacher's experiments. It is likely that a longer plating period would increase the yield.

In this procedure, RaE, a bismuth isotope, is also plated out as quantitatively as Po but is of little consequence because of its short half life of 5 days.

These results are reported in order to indicate the feasibility and advantages of Erbacher's method. His report, that polonium densities as high as 60 mc per cm<sup>2</sup> were reached, will also be investigated. If satisfactory densities are obtainable, the method is highly desirable in that it introduces no impurities into the purified RaD solution.

Fig. 1

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All Glass Pyrex With Exception of Quartz Beaker.

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