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MOUND LABORATORY
Operated By
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MIAMISBURG, OHIO

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REPORT

FOR

GENERAL RESEARCH

APRIL 1 to JULY 26, 1950

(Actinium Volume)

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Hugh Kinsey
Authorizing Official

Date: 5/26/09

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Approved By:

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Problem Title - The Separation of Actinium from Radium
Report By - P. M. Engle
Work Done By - W. T. Brown and P. M. Engle

INTRODUCTION

The present phase of the actinium program involves selecting a process and designing the necessary facilities to separate the actinium from five-gram batches of irradiated radium. This installation will serve as a pilot plant for future work and will provide a source of appreciable quantities of actinium. In the selection of a process we are relying to a great extent on the work done by F. T. Hagemann at Argonne National Laboratory.¹ Our facilities and equipment, for the most part, will be either developments of the Remote Control Division of Argonne National Laboratory or modifications of their work.

DETAILED REPORT

The installation to be constructed for this work should prove to be extremely useful for future research and development work requiring shielding equivalent to approximately four inches of lead. The "cave" structure will provide a shielded working space 3 1/2 feet wide by 19 feet long. This space will be visible from the front through four shielding windows and accessible from the rear and ends through shielding doors. This area will be served by a Rectilinear Electrical Manipulator and other special devices to facilitate remote controlled operations.

The most important deviation from the installation at Argonne National Laboratory is that the doors in the operating side of the cave will be eliminated and this wall will be sealed. Room partitions will be so arranged that the area in front of the cave is separate from that in the rear, and as many operations as possible will be performed from the front area. This change is being made to reduce the spread of radon and other contaminants that existed at Argonne National Laboratory.

The separation process as observed at Argonne National Laboratory has been fully described.² That report also contains discussions of processing difficulties, equipment, health physics problems, and other related subjects. The present plan is to install processing apparatus similar to that employed at Argonne National Laboratory and then modify and improve it as operating schedules permit. F. T. Hagemann agrees that major improvements should be sought before attempting to increase the scale of this work.

REFERENCES

1. Hagemann, F. T., J. Am. Chem. Soc. 72, 768 (1950).
2. Engle, P. M., Preliminary Report on the Actinium Separation Project, MLM-454, March 21, 1950.

Problem Title - Analytical Counting of Actinium
Report By - P. E. Ohmart
Work Done By - I. B. Grafton, P. E. Ohmart, and A. J. Rogers

INTRODUCTION

The last Quarterly Report¹ included curves showing the quantities of actinium and each of the daughter elements present for the first hundred days of the life of actinium with a half-life of 13.5 years. Also presented were curves showing the theoretical number of disintegrations per minute resulting from each of the daughter elements and the parent when the half life of the parent element was 13.5 years. Since there is a question as to whether the half life of actinium is 13.5 years or 21.7 years, this study has been extended to include data on actinium based on a half life of 21.7 years.

DETAILED REPORT

Curves showing the theoretical decay and growth characteristics and the theoretical D/M factors (the disintegrations per minute per atom of the original actinium-227) is considered as having a half life of 21.7 years are shown in Figures 1 and 2, respectively.

The results (Figure 2) are particularly interesting in that they indicate that if the beta radiation from a sample of actinium is counted within 2.5 days after preparation, the counting error caused by the growth of daughter elements would be less than one per cent.

REFERENCE

1. Grafton, I. B., Ohmart, P. E., and Rogers, A. J., Analytical Counting of Actinium, Quarterly Report for General Research, MLM-443-3 (January - February - March, 1950).

FIGURE 1

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FIGURE 2

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