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Neutron Irradiation of Am^{241} Effectively Produces Curium

Reports are now available on the production of multicurie amounts of highly alpha-active Cm^{242} from Am^{241} irradiation. A computer study on production of the isotope was undertaken because of the increasing need for Cm^{242} in research.

Am^{241} was considered as a starting material for the following reasons:

1. As plutonium-based power reactors become more common, large amounts of Am^{241} will become available as a byproduct of plutonium fuel reprocessing.
2. Am^{241} can be obtained from separated reactor plutonium by a simple "milking" operation, whereas other heavy nuclide targets require a complicated preliminary preparation followed by an industrial-scale remote-processing step.
3. High total yields of curium can be obtained from an Am^{241} target irradiated in a properly selected neutron flux.
4. The decay product of Cm^{242}, Pu^{238} ($t_{1/2}$ = 89.6 yrs), is an isotope of much interest as an isotopic power source, so it would be a valuable byproduct.

The proposed production scheme would involve irradiation of Am^{241} in fluxes of the order of 5 to 7 × 10^{14}n/cm^2/sec to the point of maximum curium production. The irradiated material would then be processed to isolate the curium fraction. If the application required the use of an extremely intense alpha source, the Cm^{242} product could be used at this point. If the requirement was for a longer-lived heat source, the curium could be allowed to decay to Pu^{238} and used in that form.

Notes:

1. The information available includes Cm^{242} yields, curium composition, irradiation data, and production techniques and safeguards. General information on the production of transcurium elements in high neutron fluxes also can be obtained. In addition, a report is available which contains calculations made on the buildup of higher nuclides in samples of various heavy element starting materials at high neutron fluxes.
2. Additional information is contained in the following publications written by D. C. Stewart, R. W. Anderson, and John Milsted:
   (a) *Data Relating to the Production of Transcurium Elements in High Neutron Fluxes,* ANL-6932, Argonne National Laboratory, September 1964.
   (b) *The Production of Curium by Neutron Irradiation of Am^{241},* ANL-6933, Argonne National Laboratory, November 1964.
3. Inquiries concerning this innovation may be directed to:
   Office of Industrial Cooperation
   Argonne National Laboratory
   9700 South Cass Avenue
   Argonne, Illinois 60439
   Reference: B67-10501

Source: D. C. Stewart, R. W. Anderson and J. Milstead
Chemistry Division
(ARG-10030)

Patent status

Inquiries about obtaining rights for commercial use of this innovation may be made to:

Mr. George H. Lee, Chief
Chicago Patent Group
U.S. Atomic Energy Commission
Chicago Operations Office
9800 South Cass Avenue
Argonne, Illinois 60439

Category 03

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