

Transformation of Actinides and
Fission Products by Neutron Irradiations

P. B. Hemmig

There have been a number of U. S. studies of the incentives for actinide recycle and transmutation of fission products by neutron irradiations.^(1,2,3) The U. S. results to date are not totally conclusive, but generally indicate some positive benefits to actinide recycle, particularly in FBRs.⁽⁴⁾ The U. S. studies address the nature of the partitioning problems and the type of research necessary to establish technical feasibility. The desirability of actinide recycle appears to be highly dependent on overall systems economics, inclusive of fuel fabrication, fuel reprocessing, transportation requirements, and waste management. Transmutation of fission products using nuclear reactors does not appear very attractive, with the exception that it may be worthwhile to separate a few long-lived isotopes and irradiate these in high flux thermal reactors.⁽⁵⁾

Present uncertainties in actinide data are large for many isotopes; however, actions are underway by CSEWG to improve the actinide data in ENDF/B by use of nuclear theory, integral measurements and recent differential measurements. Current studies are based to a large extent on the Savannah River Laboratory nuclear data file,⁽⁶⁾ which appears to be fairly adequate for thermal reactor studies.

Further studies of transmutation methods are underway at several U. S. laboratories. The possible benefits to waste management programs are of particular interest.

References

1. W. D. Bond and R. E. Leuze, Feasibility Studies of the Partitioning of Commercial High-Level Wastes Generated in Spent Nuclear Fuel Reprocessing: Annual Progress Report for FY 1974, ORNL-5012 (January 1975).
2. H. C. Claiborne, Neutron-Induced Transmutation of High-Level Waste, ORNL-TM-3964 (1972).
3. K. J. Schneider and A. M. Platt, editors, High-Level Radioactive Waste Management Alternatives, Vol. 4, USAEC Report BNWL-1900, May 1974.
4. R. J. Breen, Elimination of Actinides with LMFBR Recycle, Transactions ANS, June 1975.
5. High Level Radioactive Waste Management Alternatives, USAEC Report WASH 1297, May 1974.
6. E. J. Hennelly, Nuclear Data for Actinide Recycle, Proceedings of Conference on Nuclear Cross Section Technology, March 1975 (to be published).