IEC-73

SUBGROUP 8

A Proposal of Integral Data Test for Minor Actinide Data (Np-237 and Am-241)

Hideki Takano
Japan Atomic Energy Research Institute

In this subgroup, as the first phase, the evaluated nuclear data of two minor actinides, Np-237 and Am-241 have been compared among ENDF/B-VI, JEF-2 and JENDL-3 ,and large discrepancies were reported by Dr. T. Nakagawa in the following data; fission cross sections of Np-237, (n,2n) cross section of Np-237, inelastic scattering cross sections of Np-237 and Am-241, and number of neutron per fission.

As the second phase, the effect of the large discrepancies on integral data is investigated. At first, I propose the following benchmark calculations for fast and thermal reactors.

(1) Fast reactor benchmark: Integral data measured with the FCA-IX critical assembly (Ref.1, 2)

The FCA-IX assembly series consist of seven uranium fuelled cores which are built so as to cover the wide range of neutron spectrum shape and to test fission and capture cross sections of higher actinides. The assemblies IX-1 to IX-6 were composed with 93 % enriched metal uranium, and diluent materials were graphite for the assemblies IX-1 to 3 and stainless steel for the assemblies IX-4 to 6. The assembly IX-7 was composed with 20 % enriched metal uranium without diluent materials. By analyzing these measured data we can investigate the relation between integral and nuclear data depending neutron spectrum. The integral data measured are the keff, central fission rate ratios of several actinide nuclides (Pu-239, U-238, Np-237, Pu-238, Pu-242, Am-241 and Am-243) to U-235 and central sample worths of minor actinides (Np-237, Pu-238, Pu-242 and Am-243).

(2) Thermal reactor benchmark:

A. Burnup data analyzed destructively for the existing PWR spent fuels (Ref. 3)

Amount of nuclides constituting PWR spent fuels whose burnup were between 6.9 and 34.2 GWd/MTU were measured by destructive analysis. The measurements of thirty nuclides of uranium, transuranium and fission product elements were performed by mass spectrometry, alpha ray and gamma ray spectrometry.

B. Data book of the isotopic compositions of spent fuel in light water reactors(Ref.4)

The data were compiled for Yankee(PWR), Trino Vercellese(PWR), Obringheim (PWR), Garigrions(BWR), Gundremmingen(BWR), Monticello(BWR) and some Japanese PWR and BWR.

References

1) T. Mukaiyama et al.: Actinides Integral Measurement in FCA Assemblies, Nuclear Cross Section for Technology, Proc. Inter. Conf., Santa Fe, May, 1985.
2) S. Okajima et al.: Evaluation and Adjustment of Actinide Cross Section Using Integral Data Measured at FCA, Nuclear Data for Science and Technology, Proc. Inter. Conf., Mito, 1988.
3) Y. Nakahara et al.: Amount of Nuclides Constituting PWR Spent Fuels, Radiochimica Acta 50, 141–149, 1990.
4) Y. Naito et al.: Data book of the Isotopic Compositions of Spent Fuel in Light Water Reactors, JAERI– M93–061 (1993).

Note: A request from the new coordinator to the members of subgroup 8.
Would you please propose several benchmark data for the minor actinides ?