Status of the International Fusion Evaluated Nuclear Data Library

by

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The IAEA Nuclear Data Section, in co-operation with several national nuclear data centres and research groups, is creating an internationally available Fusion Evaluated Nuclear Data Library (FENDL), which will serve as a comprehensive source of processed and tested nuclear data tailored to the requirements of the Engineering Development Activities (EDA) of the International Thermonuclear Experimental Reactor (ITER) Project and other fusion-reactor development projects. The first version of this library, FENDL-1, intended to be finalized and distributed around the middle of 1992, will consist of the following sublibraries:

- coupled 175 group neutron-42 group gamma cross section sets (VITAMIN-J structure) processed with the NJOY system for neutron and gamma-ray transport calculations for 62 elements and isotopes of primary fusion interest;

- 256 of the most important neutron activation cross sections for the estimation of radiation hazards;

- charged particle nuclear reaction cross sections for the D-T plasma constituents p, d, t, ^{3}He and ^{4}He;

- fusion-relevant neutron dosimetry cross sections.

For the multigroup cross section library, ENDF/B-VI files were selected by a series of IAEA advisory groups as major source of basic evaluated data, supplemented by JENDL-3 and BROND files. Pointwise cross section data have been reconstructed from resolved resonance parameters and linearized with thinning tolerances of 0.1%. Self-shielded cross sections are being calculated for 300, 900 and 1500 Kelvin and dilution factors of 10^{0}, 10^{1}, 10^{2}, 10^{3}, 10^{4} and 10^{10} barns. Thermal scattering-law data are being included for Be in Be metal, C in graphite and H in water. Following a request from ITER for neutron and gamma shielding calculations, the following specific elements were added: Na, Mg, P, S, Cl, K, Ca and Ta.

For the second version of FENDL, FENDL-2, extensive benchmark-testing of FENDL-1 data and intercomparisons with newly available data files are planned with the aim to improve the physical reliability of FENDL-1 data for neutron-gamma transport and activation studies. Also, in order to allow the users to carry out realistic activation calculations, the activation cross section sublibrary will be extended by several thousand additional reactions, so as to contain all targets with half lives greater than 10 days and all reactions energetically possible below 20 MeV.

For further details of the current FENDL project activities the reader is referred to references [1,2,3].

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References

(1) D.W. Muir, S. Ganesan and A.B. Pashchenko; FENDL: a reference nuclear data library for fusion applications. Proceedings of the International Conference on Nuclear Data for Science and Technology, Jülich, Germany, 13-17 May 1991; to be published.

(2) D.W. Muir, S. Ganesan and A.B. Pashchenko; Status, plans and international co-operation in the preparation of the International Fusion Evaluated Nuclear Data Library (FENDL), Proceedings of International Workshop on Fusion Neutronics, Karlsruhe, Germany, 7 June 1991, JAERI-memo 03-305, September 1991, p. 205f.

(3) Summary Report of the Advisory Group Meeting on "FENDL-2 and Associated Benchmark Calculations", organized by the IAEA and held in Vienna, 18-22 November 1991 (Document INDC(NDS)-260/L+F).