JENDL FP Decay Data File 2000 and the Beta-Decay Theory

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Abstract

JENDL FP Decay Data File 2000 has been developed as one of the special purpose files of the Japanese Evaluated Nuclear Data Library (JENDL), which constitutes a versatile nuclear data basis for science and technology. In the format of ENDF-6 this file includes the decay data for 1087 unstable fission product (FP) nuclides and 142 stable nuclides as their daughters. The primary purpose of this file is to use in the summation calculation of FP decay heat, which plays a critical role in nuclear safety analysis; the loss-of-coolant accident analysis of reactors, for example. The data for a given nuclide are its decay modes, the Q value, the branching ratios, the average energies released in the form of beta- and gamma-rays per decay, and their spectral data. The primary source of the decay data adopted here is the ENSDF (Evaluated Nuclear Structure Data File). The data in ENSDF, however, cover only the measured values. The data of the short-lived nuclides, which are essential for the decay heat calculations at short cooling times, are often fully lacking or incomplete even if they exist. This is mainly because of their short half-life nature. For such nuclides a theoretical model calculation is applied in order to fill the gaps between the true and the experimentally known decay schemes. In practice we have to predict the average decay energies and the spectral data for a lot of short-lived FPs by use of beta-decay theories. Thus the beta-decay theory plays a very important role in generating the FP decay data file.