Improvement of Prediction Power of FP Summation Calculations by Use of the TAGS Experimental Data

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In May 2005, the European evaluated nuclear data library JEFF3.1 was released, which includes the FP decay data. It is noteworthy that the discrepancy in the gamma-ray component of the decay heat is not improved from the previous version, JEF2.2, and becomes even worse (Fig.1). The beta-ray component is also discrepant (overestimation).

On doing fission product (FP) decay heat calculations, we have to pay attention to the problem that the beta-transitions to the highly-excited levels are apt to be lost, which is known as the pandemonium problem. The calculated results based on JENDL are quite consistent with the sample-irradiation measurements that were performed world wide. On the other hand, JEFF3.1 could not reproduce the integral measurements so well. It is because JENDL is made up of experimental data with supplementation of the nuclear model calculation on the basis of the gross theory of beta decay. On the contrary, JEFF3.1 is composed only of experimental data except for no data nuclides.

In the early 1990's, Total Absorption Gamma-ray Spectrometer (TAGS) measurement was carried out at INEL (Idaho National Engineering Laboratory) for 45 isotopes. One of the most important properties of TAGS measurement is that it is expected to be pandemonium problem free. In this respect, the TAGS measurement is considered that it may provide a solid basis of the summation calculations.

On introduction of TAGS data into the summation calculations, the average beta- and gamma-ray energy par decay (E_β, E_γ) are replaced by the TAGS-origin values for these 45 nuclides. As a result, JEFF3.1 becomes quite consistent with sample-irradiation measurements. The excellent agreement on JENDL, however, is no longer maintained. It is probably because that the theoretical correction of JENDL is valid only on the average property of the nuclides, whereas TAGS measurement provides the information of each individual nuclide. Therefore, we must get the more TAGS data.

Now some isotopes that should be measured on the future TAGS measurement are suggested. They are ^{98}Nb, ^{100}Nb, ^{105}Mo and ^{102}Tc. Their isotopes have great difference between JENDL and JEF2.2 after introduction of the TAGS data. It is shown in Fig.2. At the same time, it is necessary to measure a couple of 45 isotopes again to verify the reliability of TAGS measurement. The result based on JEFF3.1 will be presented at the meeting.

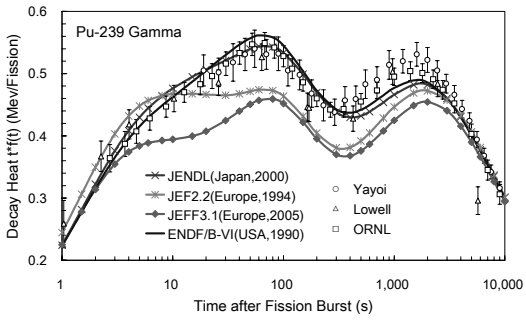

Fig.1 Effect of introducing TAGS energies into summation calculations Pu-239 fission burst, Gamma-ray component

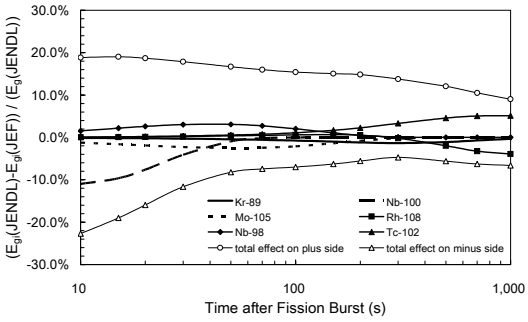

Fig.2 Nuclide-wise contributions to the difference between JENDL and JEF2.2 after introduction of the TAGS data measurement