PARAMETRIC STUDIES TO UPDATE THE CROSS SECTION LIBRARY FOR THE WIMSD CODE USED IN REACTOR ANALYSIS

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Abstract

WIMS-D/4 is one of the most widely used general purpose reactor analysis code. One of its many versatile uses is to generate problem dependent macroscopic group constants for reactor calculations. While doing so, a few difficulties were observed in the process. The data base from which the original WIMS-D library was created is rather old and obsolete. One of its disadvantages is the group constants library which is deficient for some materials of interest. We have used WIMS-D/5 version for generation of group constants. A new cross section library based on ENDF/B-VI data generated by the Institute of Nuclear Science and Technology, AERE, Savar, was used as supporting data base for WIMSD code. Integral parametric studies on TRX-1, TRX-2; BAPL-1, BAPL-2, BAPL-3 benchmark lattices were performed for library validation. The reaction edit parameters: ρ^{28} (ratio of epithermal to thermal ^{238}U captures), δ^{25} (ratio of epithermal to thermal ^{235}U fissions), δ^{28} (ratio of ^{238}U fissions to ^{235}U fissions) and c^* (ratio of ^{238}U captures to ^{235}U fissions) were investigated in details. The calculated k_{eff} (finite medium effetive multiplication factor) under predicts the experimental values where the same calculation based on the old WIMSD library over predicts the k_{eff}. Some input options and calculational models were investigated. The 'flux calculator option' under predicts the k_{eff} compared to the 'GROUPR' option iwt=5. The discrepancy is significant. The k_{eff} has been calculated for Al^{27} from revision 0 (r0) and revision 3 (r3) data of ENDF/B-VI release. The results show that the r0 data for Al^{27} is reasonably good for use and r3 data release contains some bugs. Significant differences of the integral parameters have been observed, when these parameters were calculated by considering free hydrogen and hydrogen bound in water. The results of the GROUPR option iwt=5 were compared with those for flux calculator model option. It was found that GROUPR option iwt=5 yields better agreement with the experimental values. The results of the work are expected to contribute in the WIMSD library update project initiated by International Atomic Energy Agency (IAEA).