Process of Benchmark Data

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Previously, we carried out design studies for an ADS system under HYPER (HYbrid Power Extraction Reactor) project, having in mind to utilize KOMAC proton accelerator proposed to deliver high power (1 GeV, 20 mA) proton beam for engineering applications. Even though the proton accelerator is under construction after the energy scaled down to 100 MeV, we still expect that the high current proton beam can provide enough spallation neutrons for various applications except for HYPER system. In Korea, recently, a study group was established to prosopse KoRIA (Korea Rare Isotope Accelerator) project, a system of heavy ion accelerators consisting of a linac (200 MeV) and a cyclotron (a few tens MeV) with ISOL that can serve various research groups from basic sciences to application fields.

Since particles and heavy-ions transport include many complex nuclear processes, a reliable and accurate transport code plays an essential role in the design study of accelerator-based nuclear systems as well as in various applications. The understanding of spallation mechanism is important to implement event generators on the basis of physics models compiled in the simulation code. The spectrum of benchmarked codes' prediction power is more or less wide, but some of them seemed to be reasonable for most of neutron spectra and average multiplicities for engineering applications.

In ADS and RIA studies, detail nuclear data for various residue productions are important in design phases and in assessment of their performance as well. The simulation results with benchmarked codes show comparably large deviation from the experimental data in the mass/charge of product nuclides far from the near spallation region because of delicate nuclear processes involved. To become reliable tools for accelerator-based nuclear systems, all simulation codes seem to be needed further improvements to enhance their prediction power in a broader range of nuclear reactions.

In some cases, some kind of preprocessing and/or post-processing might be needed to compare benchmark results with various experimental data and/or other simulation outputs. Frequently the post-processing requires to be coupled with other packages in which the data exchange or compatibility might be a big challenge. The benchmark data posted on website seemed to be properly processed neat enough for analyses, however, it would be much better if it can accommodate residue production cross section for each isotope.