Assessment of Stellar Nucleosynthesis Abundances using ENDF/B-VIII.0 and TENDL-2015 Evaluated Nuclear Data Libraries

B. Pritychenko

Brookhaven National Laboratory

Evaluated Nuclear Data File (ENDF) libraries contain complete collections of reaction cross sections, angular distributions, fission yields and decay data. These data collections have been used worldwide in nuclear industry and national security applications. It represents a great interest to explore the recently-released ENDF/B-VIII.0 library for nuclear astrophysics purposes and compare findings with the predictions of Talys Evaluated Nuclear Data Library (TENDL-2015) and Karlsruhe Astrophysical Database of Nucleosynthesis in Stars (KADoNiS).

The Maxwellian-averaged cross sections (MACS) and astrophysical reaction rates were calculated using the ENDF/B-VIII.0 and TENDL-2015 evaluated data sets. The calculated cross sections were combined with the solar system abundances and fitted using the classical model of stellar nucleosynthesis. Astrophysical rapid- and slow-neutron capture, r- and s-processes, respectively, abundances are extracted from the present data and compared with available values. Further analysis of MACS reveals the potential astrophysical data deficiencies and strong needs for new measurements. The current results demonstrate large nuclear astrophysics potential of evaluated libraries and mutually beneficial relations between nuclear industry and research efforts.