5 - 25 Research Activities of Nuclear Data Research Group in 2016

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In 2016, the main research activities of Nuclear Data Research Group were focussed on nuclear data measurements, calculations and fundamental research in heavy ion reactions. Some important results have been obtained.

The neutron spectra for deuteron-induced reactions on Pb (thin target) and Be (thick target) at 150 MeV/u were measured based on the N-TOF spectrometer[1]. The experimental data were compared with GEANT4 calculations coupled with different spallation reaction models (INCL, BIC and BETINI models). It is found that the INCL model appears to reproduce the experimental results most closely.

Benchmarking of evaluated neutron nuclear data libraries were performed for ∼14.8 MeV neutrons on graphite and silicon carbide targets. The experiments were carried out by using the benchmark experimental facility at China Institute of Atomic Energy (CIAE). The leakage neutron spectra from SiC and graphite at 60° and 120° were measured by the time-of-flight (TOF) method. The obtained results were compared with the MCNP simulations with the ENDF/B-VII.1, JENDL-4.0 and CENDL-3.1 libraries[2,3]. The graphite and SiC data in CENDL-3.1 were verified for the first time and were proved to be reliable.

An antisymmetrized molecular dynamics model (AMD-FM) was modified to take into account the Fermi motion explicitly in its nucleon-nucleon collision process[4]. Calculated high-energy proton spectra are compared with those of ^{40}Ar+^{51}V at 44 MeV/u and those of ^{36}Ar + ^{181}Ta at 94 MeV/u. Both of the experimental data are reasonably well reproduced by AMD-FM model. Using AMD-FM model, the energy spectra and angular distributions of light charged particles from 95 AMeV ^{12}C +^{12}C were calculated and compared with the experimental data. The experimental results are well reproduced by AMD-FM calculations. The production mechanism of LCPs are studied.

The production spallation neutron double differential cross sections for Be, Al, Fe, W, and U targets at incident proton energies between several hundred MeV and GeV are studied by using the GEANT4 and FLUKA codes and compared with the experimental data. It is found that the GEANT4 and FLUKA calculations well reproduced the experimental data.

References

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[3] F. Luo, R. Han, Y. Nie, et al., Fusion Engineering and Design, 112(2016)355.

[4] W. Lin, X. Liu, R. Wada, et al., Phys. Rev. C, 94(2016)064609.