Abstract

Energy is an important part of powering human technologies and for sustainable economic growth. The conventional way of generating electricity contaminates the climate by emitting CO_2 in the air also the fossil sources are limited. Therefore, to fulfill the increasing demand of electricity a more accessible, sustainable, and affordable low-carbon energy power option is Nuclear. The advanced nuclear reactors provide clean and reliable energy with advanced safety options and optimized cost-effective designs. Therefore, the collaborative efforts to develop next generation nuclear energy systems are taken to provide the future energy needs of the world. The fast reactors, advanced heavy water reactor (AHWR), compact and high-temperature reactors (CHTR), accelerator driven sub-critical systems (ADSs), Gen IV and fusion reactors are the most important candidates of the present time to enhance the nuclear power generation to fulfill the increasing energy demand. The neutrons, protons, and other particles produced during the nuclear processes in the reactors demand nuclear data for the development such as nuclear waste management, reduction in transmutation of structural materials, and long life of reactors. A dataset of neutral and charged particle induced reaction will fulfill the objectives and also help us to enhance the data libraries.

Besides nuclear technology, the nuclear data are required to address the quest of an interdisciplinary branch of Physics: nuclear astrophysics such as the origin of the chemical elements, the inner working of our sun, the evolution and explosions of stars, and the origin, composition, age, and ultimate fate of the Universe. The puzzle of the origin of chemical elements were solved by introducing various astrophysical processes in 1957. The present work is a small contribution to the astrophysical p process which is responsible for the synthesis of 35 neutron deficient nuclei.

The present work has been carried out to provide neutron, and deuteron induced nuclear data for the reactor application and validation of the various nuclear models. The proton induced data has been measured for the reactor and astrophysical applications. The TALYS 1.9/1.95, EMPIRE-3.2.3, and ALICE-2014 statistical model codes are utilized for the validation purpose.