

Preface

Nuclear data are fundamental to nuclear engineering studies, such as the design and safe operation of various nuclear systems such as Generation IV nuclear reactors, fusion reactors, and accelerators. Improved nuclear data are essential for the study of shielding problems, radioactivity produced, and decay characteristics of materials used in reactors, as well as for the more efficient operation of nuclear power plants. Nuclear data are divided into two main groups: Nuclear reaction data, which describe the interaction of neutrons, protons, or photons with target nuclei, and nuclear structure and decay data, which describe nuclear levels, half-lives, and radioactive decay radiations.

Neutrons of different energy are produced in fission and fusion reactors. These neutrons interact with the surrounding materials, opening reaction channels depending on the threshold energy (n,γ) , $(n,2n)$, (n,α) , (n,p) , (n,d) . To characterize the probability that a particular nuclear reaction will occur, it is common to define an effective size of the core for that reaction, called the cross section. To study reactor operation and performance, a wide range of nuclear data, such as effective cross section, radioactivity, and decay properties, is needed for all materials used in reactors that have good agreement between theoretical and experimental data.

The accurate nuclear data are very important and necessary to estimate the induced radioactivity, nuclear transmutation and radiation damage in the materials under neutron bombardment. The nuclear data are given in experimental (EXFOR) and evaluated (ENDF) data format. Calculation of neutron induced reaction cross section at different energies is very important for different materials for reactor applications. There is a lack of cross section data at different neutron energies and available data have large discrepancy in published and evaluated nuclear data libraries. In present work, the neutron induced cross sections of isotopes of tungsten (W), zirconium (Zr), niobium (Nb), strontium (Sr) and rubidium (Rb) nuclides were measured using the offline γ -ray spectroscopic technique. The uncertainties involved in the cross section measurements were also calculated using covariance analysis. The measured reaction cross sections were predicated using various nuclear reaction models available in TALYS and EMPIRE codes.