Preface

In recent times, all over the world, a major effort has been directed to develop new concepts of nuclear power generation. Among different concepts, accelerator driven subcritical system (ADS), fast reactor and advance heavy water reactor (AHWR) are most important for power production. The ADS is increasingly seen as offering a promise for nuclear waste transmutation and for generating electricity from thorium, uranium or spent nuclear fuel.

The development of ADS and any advanced nuclear systems requires significant amount of new nuclear data in extended energy regions for a variety of new materials which includes fissile and fertile isotopes as well as structural materials. Therefore, it is necessary to have accurate knowledge of nuclear data of actinides such as yields of fission products, neutron capture cross-sections, neutron-induced fission cross-sections and decay data including half-lives, decay energies, branching ratios etc. for the design of ADS and AHWR. Particularly, yields of fission products are needed for decay heat calculation. Besides this, the yields data of fission products also needed for mass, charge and fragment angular momentum studies of fission products. Such studies can provide important information about understanding of the process of nuclear fission. Further, the neutron-induced reaction cross-sections of structural materials have tremendous impact in designing various nuclear energy systems. These cross-sections play a vital role for the safe operation of Gen-IV nuclear reactors, fusion reactors and the accelerator driven subcritical systems (ADS).

In the present work, the fission products yields and capture cross-sections in the fast neutron-induced fission/reaction of ^{232}Th have been determined in the energy range of 3.7 MeV to 15.5 MeV. The thermal neutron-induced fission cross-section of ^{233}Pa ($2n_{th}$, f) has been experimentally determined using fission track technique. The ^{233}Pa target (Half-life ~ 26. 97 days) has been prepared at Radiological Laboratory (RLG), B.A.R.C, Mumbai. The radiochemical separation technique has been employed to separate ^{233}Pa from the irradiated thorium nitrate. Further, the neutron-induced reaction cross section of the Zr isotopes has also been measured at thermal, 2.45 MeV and 9.85 MeV. The experiments were carried out using

APSARA reactor, Purnima Neutron Generator at BARC and at BARC-TIFR Pelletron Facility, Mumbai, India.

The measured cross-sections have been generated theoretically using nuclear model based computer code TALYS 1.2 and compared with experimental data. Further, the experimentally measured neutron cross-sections data were also compared with latest available evaluated nuclear data libraries from ENDF/B-VII, JENDL 4.0, JEFF 3.1 and TENDL 2010.

The above measurements of neutron-induced reaction and fission cross-section data have been compiled into IAEA-EXFOR data base. In addition to this, the Indian experimentally measured nuclear physics data from various Indian laboratories and Institutions have also been compiled into IAEA-EXFOR database as per NDS, IAEA guidelines and requirements.