^{232}Th (n, 2n) ^{231}Th reaction cross-section measurement at an average E_n = 15.5 MeV

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Abstract

Accelerator driven sub-critical systems (ADS) [1,2] based on the Th-U fuel cycle is relevant because one can exploit its potential to design hybrid reactor system that can produce nuclear power with the use of thorium as a main fuel [3]. The ^{232}Th - ^{233}U fuel cycle has an added advantage that it minimizes the production of the troublesome long lived actinide waste. The ADS based thorium burners may need only small and limited quantities of uranium and plutonium fuel to serve as starter seeds. When using thorium as a nuclear ADS fuel, the study of the production of problematic transthorium is essential. The development of ADS systems requires significant amount of new and improved nuclear data in extended energy regions. Further, the energy produced in ADS is due to neutron-induced fission of long lived minor actinides. Therefore for the design of ADS, it is nesessary [4] to have accurate knowledge of nuclear data of actinides such as yields fission products, neutron capture cross-sections and decay data including half-lives, decay energies, branching ratios etc. In view of this, ^{232}Th(n, 2n) ^{231}Th reaction cross-section has been determined using an activation and off-line γ-ray spectrometric technique at average neutron energy of 15.5±0.7 MeV. The experiment was carried out using the 14 UD BARC-TIFR Pelletron facility at Mumbai, India. The ^{7}Li(p, n) reaction was used to generate neutron beam. The experimentally determined cross-section was compared with latest available evaluated nuclear data libraries of ENDF/B-VII.0, JENDL 4.0, JEFF 3.1, and TENDL 2010 and found to be in good agreement. The ^{232}Th(n, 2n) ^{231}Th reaction cross-section was also calculated theoretically using the nuclear model based computer code TALYS 1.2 and compared with the experimental data.

References

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