

Cross Section Measurement for Formation of Metastable State of ^{111m}Cd through $^{111}\text{Cd}(\gamma, \gamma')$ ^{111m}Cd Reaction Induced by Bremsstrahlung Generated through 6 MeV Electrons

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Abstract : Photon induced average reaction cross section of $^{111}\text{Cd}(\gamma, \gamma')$ ^{111m}Cd reaction was experimentally determined for the bremsstrahlung energy spectrum of 6 MeV by utilizing the activation and offline γ -ray spectrometric techniques. The 6 MeV electron accelerator Racetrack Microtron of Savitribai Phule Pune University, Pune was used for the experimental work. The bremsstrahlung spectrum generated by bombarding 6 MeV electrons on lead target was theoretically estimated by FLUKA code. Bremsstrahlung radiation can have energies exceeding the threshold of the particle emission, which is normally above 6 MeV. Photons of energies below the particle emission threshold undergo absorption into discrete energy levels, with possibility of exciting nuclei to excited state including metastable state. The $^{111}\text{Cd}(\gamma, \gamma')$ ^{111m}Cd reaction cross sections were calculated at different energies of bombarding Photon by using the TALYS 1.8 computer code with a default parameter. The focus of the present work was to study the (γ, γ') reaction for exciting ^{111}Cd nuclei to metastable states which have threshold energy below 3 MeV. The flux weighted average cross section was obtained from the theoretical values of TALYS 1.8 and TENDL 2017 and is found to be in good agreement with the present experimental cross section.

Keywords : bremsstrahlung, cross section, FLUKA, TALYS-1.8

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