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Measurement of the Differential Cross Sections of 6Li(n, t)4He Reaction at CSNS Back-n White Neutron Facility

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The cross section of 6Li(n, t)4He reaction is adopted as standards up to 1 MeV due to its relatively high cross-section. However, in the neutron energy above 0.5 MeV, it was indicated that the cross section might be overestimated by evaluated data, such as ENDF/B-VIII.0 and JEFF-3.3 [1]. Besides, due to the high Q value (4.78 MeV), the 6Li(n, t)4He reaction is widely used in neutron detection in various nuclear physics experiment and other applications, for example, tritium production for fusion reactors. However, in few MeV energy region, the experimental data on the 6Li(n, t)4He reaction are quite limited, and discrepancies among different measurements and evaluations were found for an energy range above 3.0 MeV [2]. In addition, the differential cross section of 6Li(n, t)4He reaction could provide information on the excitation levels of the compound nucleus 7Li.

In order to resolve the discrepancies and to improve the accuracy of 6Li(n, t) 4He differential cross section in the 3-6 MeV neutron energy region, the 6Li(n, t)4He reaction was measured at the China Spallation Neutron Source (CSNS) Back-n white neutron source. The differential cross-sections of the 6Li(n, t)4He reaction at 7 detection angles ranging from 21.4° to 90° are obtained with Si-PIN detectors for neutron energy from 40 keV to 6.8 MeV. The measured cross section will be presented in the talk, the comparison between the present differential cross-sections with existing data and evaluations, as well as R-matrix calculations will be shown.

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