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The Precise Measurement of Triton-Producing Three-Body Breakup Reaction of 7Li Nucleus Induced by Fast Neutrons with the Multi-purpose Time Projection Chamber at CSNS

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Tritium is important in fusion facility and one of the main ways to realize tritium production is the triton-producing reaction of lithium nucleus induced by neutrons. Generally the cross section of neutron induced triton-producing reaction of 6Li has a large value in a wide range of neutron energy, while in the energy range of fast neutron the triton production is dominant by the reaction of 7Li nucleus. In the research of Molten Salt Reactor (MSR) the cross section data of triton-producing reaction of 7Li will significantly influence the estimation of tritium production and the design of reactor. The cross section data of triton-producing reaction induced by fast neutrons is important for the calculation of tritium yield and tritium breeding rate In the research of fusion facility. The triton-producing reaction of 7Li is a three-body reaction, including the sequential decay, the quasi-elastic scattering and the direct breakup processes. The double differential cross section data and integral craoss section data are necessary for the theoretical model construction and fitting parameters constraint. Currently the data of 7Li triton-producing reaction are mainly the integral cross section data and double differential data of secondary neutrons, and the double differential data of secondary charged particles are scarce, limiting the further research of reaction theory. The precise measurement of triton-producing reaction of 7Li is limited by the technology of detection and measurement. Considering the latest developed Multi-purpose Time Projection Chamber (MTPC) at CSNS, it is possible to measure the kinetic process of triton-producing reaction of 7Li by the momentum and energy reconstruction of the secondary particles. And the systematic measurement of the reaction will be conducted at the Back-n white neutron source to provide more data sets in details for theoretical model construction and data evaluation.

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