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Study of thick target neutron yields from deuteron- and triton-induced reactions at 6.7 MeV/u 厚い標的からの重陽子及びトリトン入射中性子生成に関する研究

Friday, 19 November 2021 11:00 (30 minutes)

Deuteron-induced reaction is a candidate of accelerator-based neutron source for various applications such as radiation damage evaluation for fusion materials, medical radioisotope productions, etc. For the design of such neutron sources, the data of double-differential thick target neutron yields (DDTTNYs) from (d,xn) reactions have been systematically measured at Kyushu University. On the other hand, Drosg et al. recently addressed the production of neutrons using (t,xn) reactions, and measured the DDTTNYs with 6.7 MeV/u tritons[1]. Since a triton has one more neutron than a deuteron, tritons are expected to generate more neutrons than deuterons. However, no comparison of DDTTNYs from (d,xn) and (t,xn) reactions has been reported ever because their DDTTNY data is only available due to difficulty of triton handling. In this work [2], we have measured DDTTNYs with 6.7 MeV/u deuterons for LiF, C, Si, Ni, Mo, and Ta targets, compared the measured data with the previous triton data at the same incident energy per nucleon, and performed a theoretical analysis of the (d,xn) and (t,xn) reactions. The experiment was conducted with 8-MV Tandem accelerator at the Center for Accelerator and Beam Applied Science at Kyushu University. The 6.7 MeV/u deuteron beam was irradiated on the targets, all of which had enough thicknesses to stop the incident deuterons completely. The emitted neutrons were detected using an EJ-301 liquid organic scintillator (5.08 cm in dam, × 5.08 cm in length). The neutron spectra were derived with the unfolding method using FORIST code. The detail of the experimental procedure was described in Ref. [2] In the presentation, the results of the (d,xn) spectra will be compared with the (t,xn) spectra, and further discussion on the reaction mechanisms of deuteron- and triton-induced incidences will be given.

[1] M. Drosg et al., Nucl. Sci. Eng. 182 (2016) pp. 256
[2] H. Takeshita et al., Nucl. Instrum. Meth. A, 983, 164582, (2020)

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