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Measurement of the astrophysical ^{8}Li(α, n) reaction cross section

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It has been discussed that (α, n) reactions of light neutron-rich radioactive nuclei play important roles in the r-process at a 'hot bubble' formed in a supernova explosion[1]. A systematic study of these astrophysical reaction rates has been started at the Tandem facility in Japan Atomic Energy Research Institute (JAERI). Direct measurements of ^{8}Li(α, n)^{11}B, ^{12}B(α, n)^{15}N, ^{16}N(α, n) ^{19}F reaction cross sections have been performed, so far. In particular, the ^{8}Li(α, n) is one of critical reactions in going to heavier elements across the stability gap of A = 8 not only in the r-process but also in the possible nucleosynthesis at the Big Bang. We will report a result of the exclusive measurement in the energy region of E_{cm} = 0.7 - 2.6 MeV together with a preliminary one in the lower energy region of E_{cm} = 0.14 - 1.7 MeV covering the Gamow window at T_9=1. The ^{8}Li-RNB was produced via the ^{9}Be (^{7}Li, ^{8}Li) ^{8}Be transfer reaction and was separated using the recoil mass separator. The typical intensity and purity were 5.0 kpps and 99%, respectively. Then, ^{8}Li enters directly to a gas counter named as Multiple-Sampling and Tracking Proportional Chamber (MSTPC) filled with He (90%) + CO_2(10%). The He-gas works not only as a counter gas but also as a gas target. Three-dimensional trajectories and energy losses of all the charged particles were measured to identify the reaction point and its energy. Neutrons emitted simultaneously were also measured by a plastic-scintillator array. The excitation function of the reaction cross section was thus measured in the broad energy range. The obtained result has ten times better statistics compared to the previous exclusive measurement[2]. An improved astrophysical S-factor will be discussed together with some information of excited states in the compound nucleus, ^{12}B. I will also mention about relevant experimental plan, which will be performed using light neutron-rich RNBs supplied from JAERI-RMS or Tokai Radioactive Ion Accelerator Complex (TRIAC)[3]. [1] M. Terasawa et al., Astrophy. J. 562 (2001) 470. [2] Y. Mizoi et al., Phys. Rev. C62 (2000) 065801. [3] H. Miyatake et al., Nucl. Instrum. Meth. B204 (2003) 746.