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Nuclear Reactions with light ion and photon beams: Contributions to Neutrino Astrophysics

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In the star burning, the reaction processes such as charge exchange, inelastic scattering and fusion take place on the basis of the star hierarchy structure with various densities and temperatures. Experimental information from the nuclear reactions has been applied to the astrophysical phenomena observed by telescopes and to understand the isotope composition of meteorites in the solar and galaxy systems. For examples, charge-exchange reaction cross-sections relate closely toβ-decay and electron capture processes. From the observations of isoscalar giant monopole resonances in nuclei provided via inelastic scattering, one can argue the nuclear incompressibility, which is one of the important parameters for the supernova explosions and neutron star structure. Studies of photo-nuclear reactions are deeply related to astrophysics to understand the origin of element synthesis in the galaxy since the nuclear synthesis is made in the environment with ultra high intensity photons in supernovae. In my talk, I would like to show the recent results from the (^{3}He,t) and (t,^{3}He) and (α,α') experiments with light ion beams in relation to the neutrino astrophysics. I also show the future possibilities of photoreactions at new facilities in Japan.