

Medium energy photo-nuclear reactions for neutrino astrophysics and nuclear transmutations

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Abstract

Photonuclear reactions in the medium-energy range provide a useful tool to investigate dynamics of nuclear reactions and fundamental properties of nuclear forces. Also they give important information on the roles of neutrino-nucleus interactions in type-II supernova explosions as well as in double-beta decay processes, since the neutrino-induced transitions by weak neutral current are the direct analogs of the electromagnetic dipole transitions. Another importance of medium-energy photonuclear reactions is their possible usefulness for transmuting long-lived radioactive nuclei produced in nuclear reactors into short-lived ones. For development of such technologies it is indispensable to study basic properties of photonuclear reactions of intermediate-mass nuclei and heavy nuclei.

Laser-Compton backscattered photons (LCPs) are considered to be powerful tools for precise measurements of photonuclear reactions because of their good features such as a small energy spread, a high directivity, a high polarization, and so on. In this paper current status of the LCP facilities and examples of the recent experimental studies of medium-energy photonuclear reactions are presented.