

Current status and perspectives of nucleon and alpha knockout reaction

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The proton-induced α knockout reaction, $(p,p\alpha)$, is a powerful probe of the α formation in the nucleus. The author and the collaborators have shown that a modern theoretical calculation of the α amplitude combined with the $(p,p\alpha)$ reaction calculation by the distorted wave impulse approximation can quantitatively reproduce the existing experimental data [1]. Although the α formation is known in the light mass nuclei as the α clustering and also in very heavy nuclei as the α decay, the universality of the α formation throughout the nuclear chart has been a question. Triggered by a theoretical prediction by S. Typel [2], α formation on the surface of medium mass nuclei, Tin isotopes $^{112,116,120,124}\text{Sn}$, has been experimentally confirmed [3]. Recently, the author and the collaborator have shown that the α reduced width, which is a key quantity for describing the α decay lifetime, can also be determined by the $(p,p\alpha)$ reaction [4]. In this contribution, I will review the recent progress in the α formation phenomena studied by the above-mentioned $(p,p\alpha)$ reaction, and give a perspective on the cluster knockout reactions and novel clustering phenomena.

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