

Alpha-induced cross section measurements for explosive nucleosynthesis scenarios by the activation method

About 50% of the stable isotopes heavier than iron are synthesized via explosive nucleosynthesis processes [Thi17, Arc14, Rau13]. The path of the weak r-process (which synthesizes light neutron-rich isotopes) and the γ -process (which is mainly responsible for the synthesis of the 32-35 proton-rich nuclei) is located close to the valley of stability. Accordingly, several relevant reactions can be studied using stable targets and the activation technique [Gyü19]. The modeling of these astrophysical scenarios requires the use of reaction network calculation. The necessary cross sections are taken from the Hauser-Feshbach (H-F) model calculations. For reactions involving α -particles the key input of the H-F model is the α -nucleus optical model potential (α -OMP). By carrying out (α ,n) cross section measurements, the available α -OMP parameter sets can be studied. For this purpose a series of activation cross section measurements were carried out and further studies are in progress at Atomki. In this presentation an overview on the recent measurement of the $^{96}\text{Zr}(\alpha,n)$ [Kis21] and $^{100}\text{Mo}(\alpha,n)$ [Sze21] reactions, relevant for the weak r-process nucleosynthesis will be given. Furthermore, the cross sections of the $^{92,94}\text{Mo}(\alpha,n)$ and $^{92}\text{Mo}(\alpha,p)$ reactions were also measured to constrain the α -OMP's used in γ -process simulations. Details on the cross section measurements and their impact on the theoretical calculations will be presented.

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[Gyü19] Gy. Gyürky et al., *Eur. Phys. J. A* 55: 41 (2019).

[Kis21] G.G. Kiss et al., *Astrophys. J.* 908:2, 202 (2021).

[Sze21] T.N. Szegedi et al., *Phys. Rev. C* 104, 035804 (2021).

Length of presentation requested

Oral presentation: 17 min + 3 min questions

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Nuclear physics - experimental

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