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Study of $\alpha-$transfer reactions with ^{7}Be in the context of nuclear astrophysics

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In stellar evolution, the rate of 12C(α,γ)16O reaction controls the C/O abundance ratio at the end of the helium burning phase, thus defining the further course of development. At stellar temperatures of around 300 keV, the cross section of 12C(α,γ)16O is ~ 10−17 b, which cannot be measured using current technology. The α−capture reaction populating the natural-parity states of the residual nuclei, is an effective indirect tool for studying these types of reactions. In this case, it corresponds to the alpha pickup by 12C to populate states of 16O, predominantly the 6.917 MeV state. Loosely bound stable nuclei with prominent α−cluster structure, such as 6,7Li, 11B have also been used in such studies provided that these are "direct" α−transfer and do not proceed via a compound nucleus. However, the breakup contributions from such nuclei have a significant impact on the transfer channels. Interestingly, the 7Be nucleus, though having an α−cluster structure and a lower breakup threshold of 1.58 MeV, demonstrates lower breakup contribution compared to transfer cross section. In this context, we carried out an experiment at HIE-ISOLDE, CERN, with 7Be + 12C at E = 5 MeV/A to study α−transfer reactions populating states in 16O, that dominantly contribute to the He-burning process. Preliminary results would be presented.

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