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Transfer reactions with ^{7}Be + ^{12}C at 5 MeV/u

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We studied the transfer reactions with ^{7}Be + ^{12}C at 5 MeV/u. The measurements were carried out in the scattering chamber at HIE-ISOLDE using the pentagon detector array. Interestingly, for the ^{7}Be nucleus having an $\alpha-$cluster structure and a low breakup threshold, transfer reactions are predominant than breakup[1]. The transfer data leading to ^{16}O* excited states are useful in studying the ^{12}C$(\alpha,\gamma)^{16}$O capture reaction. This is a key reaction in the helium-burning phase of stars, affecting the C/O abundance ratio. This ratio is crucial for stellar nucleosynthesis of elements heavier than carbon and the evolution of life in the universe. The present study is also important to further understand the transfer reactions in other loosely bound nuclei like ^{6,7}Li having prominent $\alpha-$cluster structure. The required optical potential parameters for the analysis have been obtained from the elastic scattering measurements in the same experiment[1]. The Asymptotic Normalization Constant (ANC) of the ground state of ^{16}O has been measured in this reaction for the first time. The ANCs of other subthreshold states of ^{16}O particularly 6.92 MeV (2^{+}) and 7.12 MeV (1^{-}) have also been obtained and the implications will be discussed.

[1]K. Kundalia *et al.*, Phys. Lett. B 833, 137294 (2022)

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