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ASTROPHYSICAL S-FACTOR $S_{1\,16}$ EVALUATION USING ANCs ^{17}F→^{16}O+p FROM ANALYSIS OF THE ^{16}O(^{10}B,^{9}Be)^{17}F REACTION

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Knowledge of the asymptotic normalization coefficients (ANC) for the resulting single-particle bound configurations in the final nucleus (or nuclear vertex constants which differ only by a multiplier from ANCs) [1], plays a crucial role in the calculations of direct nuclear-astrophysical processes of radiative capture [2].
Particularly, to extrapolate the astrophysical S factor $S_{1\,16}(E)$ of the ^{16}O(p,γ)^{17}F reaction, which plays an important role in cold CNO cycle of hydrogen burning, it is required to know the corresponding ANCs for ^{16}O+p→^{17}F. These values can be conveniently and reliably extracted from the analysis of nucleon transfer in reactions with heavy ions at near-barrier energies.
The differential cross sections (DCS) of the reaction ^{16}O(^{10}B,^{9}Be)^{17}F measured at ^{10}B ions beam of the C-200P cyclotron of the Heavy Ion Laboratory (University of Warsaw) with the energy E_{10B}=41.3 MeV have been analyzed using the modified DWBA method [3,4]. Domination of the peripheral proton transferring was found to both proton bound states in ^{17}F nucleus and the ANC for bound ^{17}F→^{16}O+p configurations were extracted for the ground (5/2+) and first excited (E*=0.495 MeV, ½+) states. At that the squared ANC $(C_{^{10}B\to{}^{9}Be+p})^2$ [5] was used as the DCS of the reaction should be normalized by the product of the ANCs squares $(C_{^{10}B\to{}^{9}Be+p})^2\times(C_{^{17}F\to{}^{16}O+p})^2$.
Since the reaction 16O(p,γ)17F occurs through the direct radiative capture of protons at energies below E_p = 2.5 MeV (lab), the modified two body potential approach [6] was used to calculate the astrophysical S-factor $S_{1\,16}$. The obtained value of total $S_{1\,16}(0)$ within the margin of error consistent with the value obtained in [7].

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