



Contribution ID : 76

Type : Poster

THE $^{27}\text{Al}(^3\text{He}, d)^{28}\text{Si}$ REACTION MECHANISMS AND ANC FOR THE $^{28}\text{Si} \rightarrow ^{27}\text{Al} + p$ CONFIGURATIONS

Tuesday, 29 November 2022 17:10 (120)

The study of the proton transfer process during the interaction of accelerated nuclei with light nuclei near the Coulomb barrier is of great interest for astrophysics, since the information obtained from the analysis of such reactions makes it possible to estimate the astrophysical S-factors of the radiative capture of protons at very low energies, where direct measurements are impossible. For example, from the analysis of the $^{27}\text{Al}(^3\text{He}, d)^{28}\text{Si}$ reaction, one can extract the squared ANCs $C^2(^{28}\text{Si} \rightarrow ^{27}\text{Al} + p) = C_{271}^2$ of the overlap functions $^{28}\text{Si} \rightarrow ^{27}\text{Al} + p$ for all proton bound states in the ^{28}Si nucleus. It allows one to calculate the direct part of the astrophysical S-factor for the $^{27}\text{Al}(p, \gamma)^{28}\text{Si}$ reaction. The excitation energies of the $^{28}\text{Si}^*$ nucleus are high when a proton is captured ($s_p = 11.585\text{ MeV}$), and several resonances contribute to the total S-factor when even a low-energy proton is captured. At the same time, in order to calculate the contribution of the direct process to the total astrophysical S-factor of the $^{27}\text{Al}(p, \gamma)^{28}\text{Si}$ reaction, in reality it is possible to take into account the ANC values only for strongly excited proton bound states in the $^{28}\text{Si}^*$ nucleus. At that, in order to evaluate the contribution of the direct process to the total astrophysical S-factor of the $^{27}\text{Al}(p, \gamma)^{28}\text{Si}$ reaction, in reality it is possible to take into account the ANC values only for strongly excited proton bound states in the $^{28}\text{Si}^*$ nucleus. To extract the ANC values of the proton bond in the ground (0^+) and excited ($E=1.778\text{ MeV}, 2^+$), ($E=4.618\text{ MeV}, 4^+$) states of the ^{28}Si nucleus from the angular distributions of the DCS of proton transfer reactions ($^3\text{He}, d$), we performed analysis of these data within the framework of the DWBA.. An analysis of the experimental DCS of the $^{27}\text{Al}(^3\text{He}, d)^{28}\text{Si}$ reaction at the energies $E=25\text{ MeV}$ [1] and 37.7 MeV [2] in the frameworks of modified DWBA was made. The ANC values for the ground and excited states of ^{28}Si were obtained. Selection of sets of the optical model parameters for the input and output channels of these reactions was performed using literature data, including the recommended OP given in the papers with the corresponding experimental data.

References: 1. J. Veronotte, et al. Nuclear Physics A571 (1994). 2. R.W. Barnard et al. Nuclear Physics A108 (1968).

Primary author(s) : RUZIEV, E (Institute of Nuclear Physics, AS RUz, Tashkent, Uzbekistan.); ARTEMOV, S (Institute of Nuclear Physics, AS RUz, Tashkent, Uzbekistan.); ERGASHEV, F (Institute of Nuclear Physics, AS RUz, Tashkent, Uzbekistan.); TOJIBOEV, O (Institute of Nuclear Physics, AS RUz, Tashkent, Uzbekistan.);

Presenter(s) : RUZIEV, E (Institute of Nuclear Physics, AS RUz, Tashkent, Uzbekistan.);

Session Classification : Poster Session

Track Classification : Nuclear physics