$^{8}B + ^{58}Ni$ INTERACTION AT LOW ENERGIES

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Many experimental and theoretical efforts have been devoted in recent years to study the properties and interactions of exotic proton-halo nucleus ^{8}B [1–3]. Some evidences have been presented showing that for the proton-halo ^{8}B projectiles on a ^{58}Ni target at several energies near the Coulomb barrier, the resulting excitation function shows a striking enhancement associated with the exotic structure of ^{8}B with respect to that for normal projectiles. Some evidence was also presented that the sum of the fusion and breakup yields saturates the total reaction cross section.

In this presentation, we report the results of the $^{8}B+^{58}Ni$ system analysis with the method of continuum-discretized coupled channels (CDCC) in the energy interval 18 – 28.4 MeV in laboratory system, which is below and above the Coulomb barrier ($V_{c.m.}$ = 20.8 MeV). We carried out the CDCC calculations of the breakup, fusion, and elastic scattering of ^{8}B on ^{58}Ni, and compared the results with the differential cross sections and the excitation functions measured in Refs. [1, 2].

In our analysis, we studied the coupling between breakup, fusion and elastic scattering and the influence of the ^{7}Be core – target optical potential (OP) and p-target OP on the breakup and fusion cross sections. For this aim, the data on the elastic scattering for the $^{7}Be + ^{58}Ni$ and $^{8}B + ^{58}Ni$ systems, breakup, and the fusion and reaction cross sections [1, 2] were analyzed. The energy dependence of OPs was controlled by comparison of the energy dependences of the real and imaginary volume integrals. Finally, we have reproduced the experimental fusion and total reaction cross sections and have predicted their behavior at low incident energies.

A theoretical analysis within the CDCC model was made for breakup of ^{8}B using more extended model space as that in [3]: inelastic excitations in the ^{7}Be-proton system from the ground state to excited states with orbital angular momenta L = 0–5 and energies up to 8 MeV in the continuum were taken into account. We found a considerable coupling between breakup, fusion and elastic scattering and were able to adjust completely the experimental breakup, fusion, and total reaction cross sections in the mentioned earlier energy interval, simultaneously with the $^{8}B–^{58}Ni$ elastic scattering differential cross sections.

1. E.F.Aguilera *et al.* // Phys. Rev. Lett. 2011. V.107. 092701.
2. E.F.Aguilera *et al.* // Phys. Rev. C 2009. V.79. 021601 (R).
3. T.L.Belyaeva, *et al.* // Phys. Rev. C 2009. V.80. 064617.