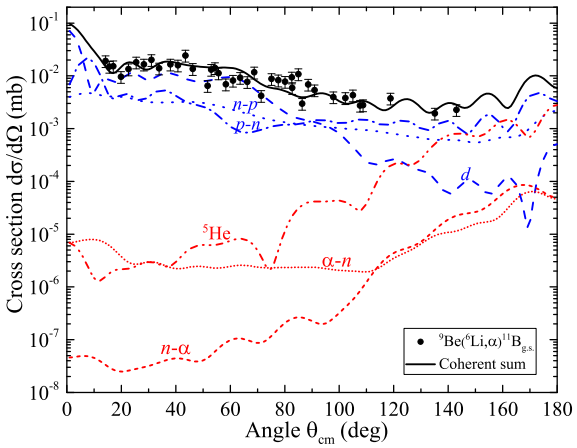
Study of internal structures of ^{9,10}Be and ^{10}B in scattering of ^{2}H and ^{6}Li from ^{9}Be

S. Lukyanov[1], A. Azhibekov[1,2], T. Issataev[1,3], K. Mendibayev[1,3], M. Naumenko[1], A. Shahov[1], Yu. Penionzhkevich[1]

[1] *Flerov Laboratory of Nuclear Reactions, Dubna, Russian Federation,*
[2] *Korkyt Ata Kyzylorda University, Kyzylorda, Kazakhstan*
[3] *L.N. Gumilyov Eurasian National University, Astana, Kazakhstan*

Angular distributions for the ^{9}Be(d,d)^{9}Be*, ^{9}Be(d,p)^{10}Be, ^{9}Be(d,t)^{8}Be, and ^{9}Be(d,^{4}He)^{7}Li channels were measured [1]. Experimental angular distributions were described within the optical model, the coupled channel approach, and the distorted wave Born approximation. The spectroscopic factors for the systems ^{9}Be =α+ ^{5}He and ^{7}Li = d + ^{5}He are close to unity, which confirms the contribution of the considered cluster configurations to the structure of ground states. The analysis shows that the contribution of the compound nucleus mechanism is negligible. In the (d, ^{4}He) channel, the deuteron transfer provides only a small contribution, whereas a relatively large contribution of ^{5}He transfer was found.

The results of recent experiment on studying nucleon and cluster transfer processes in the reactions of the ^{6}Li (68 MeV) ions with the ^{9}Be target nuclei are reported. The angular distributions for the reaction channels ^{9}Be(^{6}Li,^{4}He)^{11}B$_{g.s.}$, and ^{9}Be(^{6}Li,^{10}B)^{5}He$_{g.s.}$ have been measured. To describe the possible contributions of sequential transfer of nucleon and alpha clusters, as direct transfer of the ^{5}He cluster, the Coupled Reaction Channel method (FRESCO)[2] is used. The spectroscopic amplitudes are obtained for the configurations of (^{9}Be+d) and (^{6}Li+^{5}He) in the ^{11}B nucleus and (^{6}Li+^{4}He) in the ^{10}B nucleus. The results indicate a strong correlation between a neutron and an α, leading to the formation of the ^{5}He-cluster in the transfer processes. Figure shows the experimental differential cross sections for cluster transfer in the reaction channel ^{9}Be(^{6}Li,^{4}He)^{11}B$_{g.s.}$ (circles) compared with the results of calculations (curves). In the case of ^{5}He transfer, the following mechanisms were taken into account: simultaneous transfer (^{5}He) and sequential transfer (n+^{4}He and ^{4}He+n). The probability of the sequential transfer (α-n or n-α) is much lower than that for the process of the simultaneous transfer of ^{5}He over the entire range of angles.



[1] S. Lukyanov *et al.*, J.Phys.(London) G41, 035102 (2014).
[2] http://nrv.jinr.ru