Study of the ^{6}He,^{7}Be+^{9}Be reactions at low energy

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A study of the elastic scattering and nuclear reactions in light exotic systems ^{6}He+^{9}Be and ^{7}Be+^{9}Be is presented. The ^{6}He+^{9}Be collision was measured at the energies Elab = 12.1 MeV, 16.2 MeV and 21.3 MeV, using the RIBRAS system (Radioactive Ion Beams in Brazil) of the Institute of Physics of the University of São Paulo [1]. Angular distributions of the elastic, inelastic scattering and the alpha particles production in the ^{6}He+^{9}Be collision have been measured. The elastic scattering angular distributions were analyzed by Optical Model, Coupled Channels (CC) considering the ^{9}Be excitation and Continuum-Discretization Coupled-Channels (CDCC) calculations considering the breakup of the ^{6}He. The total reaction cross sections have been obtained from the elastic scattering analysis. The alpha-particle angular distributions were compared with the results of the CDCC calculations for the breakup of the ^{6}He projectile and, CC for the breakup of the ^{9}Be target and the angle-integrated cross section have been obtained. The data for the ^{7}Be+^{9}Be quasielastic scattering and the ^{9}Be(^{7}Be,^{8}Be)^{8}Be* transfer reaction has been measured at Elab = 23.7 MeV at CRC Radioactive Beam Facility at Louvainla-Neuve, Belgium [2]. The quasielastic angular distribution was analysed firstly using the optical model formalism, which provided the potential for the ^{7}Be+^{9}Be interaction and a normalization factor for the experimental data which was not obtained in the experiment. The contribution of the inelastic excitation of the ^{7}Be nucleus to quasielastic cross sections and the influence of the states of the continuum in the elastic scattering were investigated by Coupled Channels and CDCC calculations. The ^{9}Be(^{7}Be,^{8}Be)^{8}Be* transfer reaction was analysed in terms of the Distorted Wave Born Approximation (DWBA) and Coupled Channels Born Approximation (CCBA) methods. All the calculations have been performed using the computer code FRESCO [3]. Spectroscopic factors for the ^{9}Be$\rightarrow$ ^{8}Be+n states have been obtained and compared with shell-model predictions. The total reaction cross section ^{7}Be+^{9}Be has been obtained and compared with the ^{6}He+^{9}Be system and other systems of the literature.

References

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