Analysis of the ^{6}He(p,p'), ^{10,11}C(p,p') and ^{6}He(^{12}C,^{12}C) data at 40 A.MeV

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We have studied angular distributions of cross sections of elastic scattering of light exotic nuclei on targets of protons and carbon. Our aim was to know whether the weak binding of exotic nuclei should appreciably enhance the polarization potential, which includes the couplings to the continuum and break-up effects. We have also wanted to determine whether the models and the effective NN interactions, proved to be well adapted to the stable nuclei, had to be put into question when going far from the valley of stability.

Data for ^{6}He, ^{10,11}Be at 40 A.MeV on p and ^{12}C were measured at GANIL where the SISSI (Superconducting Intense Source for Secondary Ions) and the SPEG (Energy Loss Spectrometer at GANIL) devices have performed the production of the secondary beams and the detection of the scattered particles, respectively. The nucleus-nucleon interaction for the elastic scattering on protons is calculated with the microscopic, complex and parameter-free JLM potential [1]. A complex surface potential, with a repulsive real part, is expected to simulate the surface effects generated by the polarization potential [2]. By taking it into account, we have reproduced successfully a large set of data for the elastic scattering of exotic nuclei on protons at energies from 25 to 100 A.MeV.

In the case of ^{6}He $+^{12}$C elastic scattering, the energy resolution was good enough to separate the elastic scattering from inelastic contributions. The real part of the potential of interaction between the exotic nucleus and ^{12}C was calculated in the framework of the folding model, including new density-dependent NN interactions, recently obtained by D. Khoa and W. Von Oertzen [3]. With the polarization potential, the agreement found with the data is satisfactory.

For (p,p') reactions, the MUST device, a set of Si and Sili telescopes specifically designed to detect recoiling light charged particles, is used to measure angular distributions for elastic and inelastic scattering of radioactive beams on proton. (p,p') scattering data to the first excited state of ^{6}He at 1.8 MeV have been measured over a wide angular range with a 40.9A.MeV ^{6}He beam produced at Ganil. Inelastic scattering on proton, to the first excited state, for ^{10,11}C, were also measured at E_{lab} $\simeq$40 A MeV. The JLM potential is used to calculate the inelastic cross sections. The calculated inelastic (p,p') cross sections are sensitive to M_n/M_p factor, which is the ratio of the radial moments of the transition densities, $M_{p,n} = \int drr^{l+2}\rho^{tr}_{p,n}$. The extraction of nuclear structure information in terms of the M_n/M_p factor from the angular distributions of cross sections will be explained. We show that the ^{6}He(p,p') analysis is in favour with the halo configuration for this nucleus. The analysis of the ^{10,11}C(p,p') data is consistent with an extended matter radii of these nuclei, and with the alpha clusterization suggested in [4].

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