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MECHANISMS OF α- PARTICLE SCATTERING ON ^{12}C

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The search of optimal parameters of α-particles scattering on nucleus ^{12}C at the energies of 10-15 MeV/nucleon is essentially complicated by the presence of strong distraction in diffraction structure of elastic scattering in the range of middle angles. Therefore in the present work the study of angular distributions of elastic and inelastic α-particle scattering on nucleus ^{12}C has been carried out in order to determine the authentic parameters of optical potential (OP) in a wide energy range and take into account the contribution of various mechanisms in formation of scattering cross section.

The complex analysis of angular distributions of elastic and inelastic α-particle scattering on nucleus ^{12}C in the energy range 32-166 MeV has been carried out within the framework of the coupled channels and distorted wave methods. The analysis of experimental data on elastic scattering was carried out in several variants. The first set of optical potentials was obtained by fitting the depths and diffuseness values of real and imaginary parts of potential at the fixed radiuses (r_V =1.245 fm, r_W=1.57 fm) found by Nolte /1/. In the second variant radii values obtained from the analysis of the data at high energies were used by way of fixed radii (r_V=1.22 fm, r_W=1.85 fm). And in the third variant OP were obtained by fitting of all parameters. All three OP sets give close quality of the description of experiment on elastic scattering.

Taking into account the channel coupling in the framework of MCC (program ECIS-88) there was distinctly improved the agreement with the experimental data on scattering in the middle angle range. The obtained values of parameters of deformation β_2 are in good agreement with the literature data.

The abnormal cross-section growth, observed in angular distributions under the large angles at low (50 MeV) and high energies (104 MeV), can be reproduced taking into account the contribution of exchange mechanism of projectile with nucleus α-cluster. The obtained values of spectroscopic factor for system "α + ^{8}Be" correlate well with calculated ones /2/.

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