STUDY OF THE STRUCTURE OF ^{12}C AND ^{6}Li NUCLEI IN THE ALPHA-CLUSTER MODEL BY HYPERSPHERICAL FUNCTIONS AND FEYNMAN'S PATH INTEGRALS

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The light nuclei ^{12}C and ^{6}Li used as target and projectile nuclei in the many experimental studies of the nuclear reactions, including Flerov Laboratory of Nuclear Reaction (JINR). The study of the structure of these nuclei is necessary for theoretical description of such reactions. Wave functions of the ground state of the ^{12}C and ^{6}Li nuclei in the alpha-cluster model are calculated using Feynman's path integrals and hyperspherical functions [1]. Cubic spline interpolation is applied for solving hyperradial equations [1]. The alpha-alpha interaction in the ^{12}C nucleus is changed in comparison with well-known Ali-Bodmer potential [2]. As a result, the energy of separation to alpha-particles and the charge distributions were calculated and agreement with experimental data [3–5] was obtained (Fig. 1). The alpha-cluster model may explain the strong oblate deformation of the ^{12}C nucleus (with $\beta_2 = -0.59$ [6]). In addition, the shell model of the deformed nuclei is used to calculate the nucleon states in the ^{12}C nucleus for comparison against alpha-cluster model.

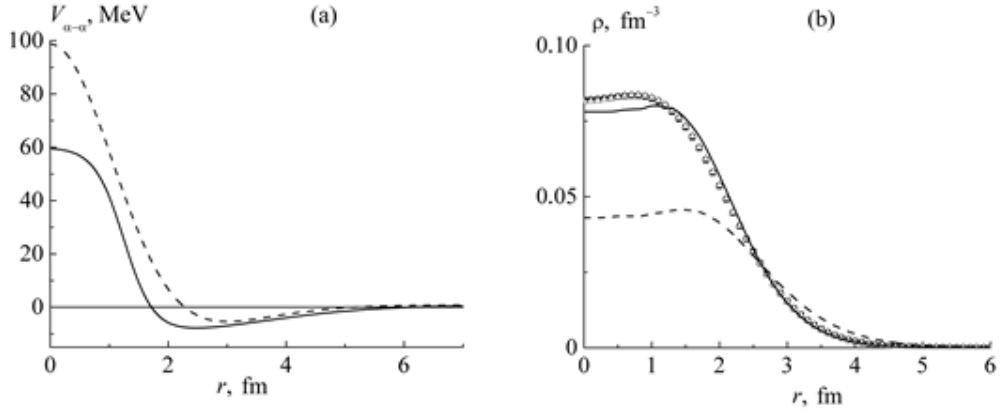

Fig.1. (a) The Ali-Bodmer potentials of the interaction between free α-particles [2] (dashed curve) and potentials between α-clusters in the ^{12}C nucleus (solid curve); (b) The charge distribution in the ^{12}C nucleus: experimental data [3–5] (symbols), results of calculations with Ali-Bodmer potentials from [2] (dashed curve) and with potentials between α-clusters in the ^{12}C nucleus (solid curve).

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