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Advanced quantum-mechanical approach in terms of collective coordinates in theory of nuclear alpha-emission

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Paper goes on the systematic studying the cooperative nuclear processes [1] with some refinement of the quantum mechanical description of the simple droplet nuclear model. The aim is to account for the most important dynamics features of the inner-nuclear processes that must lead to simplification of calculational procedure. Approach proposed must allow for systematic refinements in the frame of the formally exact perturbation theory, based on the more fundamental theory of nuclear matter. We consider a new consistent quantum-mechanical approach in terms of collective co-ordinates in theory of nuclear alpha-emission. It is supposed that Hamiltonian of e-N system used by us can be treated as the bare Hamiltonian in such a theory. It is important that the theory of the alpha emission includes the main features of the general nuclear fission theory. The classical Hamiltonian of the nuclear system is constructed accounting the Coulomb inner-nuclear interaction and strong interaction approximated by the "Yukawa plus exponent" potential. The final form of Hamiltonian accounts for some empirical information concerning the lowest alpha decaying state. As an illustration we present the preliminary results of the calculation for ^{210}Po which shows a principal value of the mass tensor character for spectrum of emitted alpha-particle.

[1] A. Glushkov, Y. Dubrovskaya et al., Adv. in Theory of Quantum Syst. in Chem. and Phys. 15, 301 (2006); Int. J. Mod. Phys. A 24, 611 (2009).

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