Investigation of nuclear forces in formation of light nuclei in compact stars

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Study of nuclear forces in extreme conditions enlarges our possibilities to understand them deeper, where star is a good laboratory for investigations [1]. We investigate ability of nuclear forces to combine nucleons as bound nuclear system in dependence on its deep location in stellar medium of compact star. In order to perform such a research, quantum mechanical model of deformed oscillator shells with two nucleon forces [2] is generalized, where a new additional influence of stellar medium on nucleus is included. A polytropic model of stars at index $n = 3$ with densities related from white dwarf to neutron star [3] is included to analysis. We observe a phenomenon of dissociation of nucleus — its disintegration on individual nucleons, starting from some critical distance between this nucleus and center of star with high density. In frameworks of such a not complicated model, we observe such a phenomenon in neutron stars, while its is not observed in white dwarfs. We have calculated such a critical distance for even-even isotopes of light nuclei in dependence on density at center of neutron star, where disintegration of these nuclei on nucleons takes place. Summarizing, we find the model of deformed oscillator shells as convenient basis for obtaining clear understanding about different forces in compact stars, basing on quantum mechanics.

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