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The properties of the $^4He_3$ and $^3He^4He_2$ three - atomic systems

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Clusters of gas atoms are a large class of molecules interacting via van der Waals type potentials. Some weakly bound clusters show universal characteristics and scale invariants related to the famous Efimov effect [1], which was experimentally confirmed in an ultracold gas of the Cs atoms [2]. The helium trimer system has been long considered as an ideal candidate for observing Efimov states. Only recently, after a long and continued research, the Efimov state as the excited state of the $^4He_3$, was detected [3]. Also, the wave function of the ^{4}He dimer has been measured via Coulomb explosion technique which enabled to determine its very small binding energy - 151.9 (13.3) neV [4].

There are many realistic He-He potential models which are more and more accurate reproduce two-body data [5]. Very accurate calculation needed in order to evaluate the effect of potential models on the characteristic of three-body system. One of the effective methods for studying triatomic clusters is based on the differential Faddeev equations.

In this work we develop an application based on the Faddeev differential equations for studying the properties of the $^4He_3$ and $^3He^4He_2$ three - atomic systems using modern realistic potentials constructed by M. Przybytek et al. in 2010 [6] and 2017 [7] years, as well as older potentials –LM2M2 [8] and TTY [9]. The calculated results we compare with the results obtained using different methods by other authors and with the experiment.

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