Equilibrium properties of a two-component Fermi gas coexisting with Bose-Einstein condensate of its heteronuclear bound states

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We study the equilibrium properties of ultracold two-component Fermi gas coexisting with Bose-Einstein condensate of heteronuclear bound states formed from its fermionic atoms [1]. To this end, we propose a microscopic approach that involves the Bogoliubov model for a weakly interacting Bose gas [2] and approximate formulation of the second quantization method in the presence of bound states of particles elaborated earlier by the authors [3]. The basic thermodynamic characteristics of the system such as the ground-state energy, the single-particle excitation spectra, the densities of molecular condensate and unbound fermionic atoms are found. The applicability conditions of the elaborated approach are discussed. The obtained results are applied to study a mixture of ^{6}Li and ^{173}Yb atoms. The quantum degeneracy of this mixture was realized experimentally that provides a good basis for creation of ultracold molecules with their subsequent condensation [4].

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