Quantum Phase Transition in Two Species of Cold Bosonic Atoms

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Abstract: In this letter, the superfluid-Mott-insulator phase transition of two-species cold bosonic atoms in an optical lattices is studied. The Hamiltonian of this model is diagonalized by means of Bogliubov transformations and by the inversion symmetry of the optical lattice, the energy spectrum of this system is obtained. From the energy gap of the excitation spectrum, the quantum phase transition condition is obtained and it is determined by the competition between the interatomic repulsions and the tunnel coupling. It is found that there exists an ordinary fluid phase when taking the zero wave-vector limit.

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