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Effect of Zeeman Field and Spin-Orbit Coupling on Fermi Gases in Optical Lattices HAIYANG ZHANG, HAI-CHAO LI, XIANGYU XIONG, GUO-QIN GE, Huazhong University of Science Technology — In this paper, we study spin-orbit coupled Fermi gases with Zeeman field in optical lattices using the Bogoliubov-de Gennes equation and mean field theory in the two-channel model. We analyze the results of two and single-channel models for different strengths of atom-molecule couplings, Zeeman field and spin-orbit couplings. We find that in the broad resonance condition or the strength of Zeeman field is strong, the single-channel model can substitute the two-channel model without any lack of accuracy. In contrast, a strong spin-orbit coupling suppresses the effect of a broad resonance and Zeeman field and the two-channel model cannot be substituted in this limit. In the two channel model, we find that there is a peak of molecular fraction with increasing strength of the atom-molecule couplings. Furthermore, it is found that Zeeman field plays a crucial role in polarizing spin of the Fermi atoms while the spin-orbit coupling suppresses the spin polarization of the ultracold Fermi gases.

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