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Topological superfluid in a Bose-Fermi mixture with spin exchange-induced spin-orbit coupling CHUANZHOU ZHU, Rice University, LI CHEN, Shanxi University, HUI HU, XIA-JI LIU, Swinburne University of Technology, HAN PU, Rice University — We investigate the ground-state properties of a mixture of spin-1/2 Bose-Einstein condensate and spin-1/2 Fermi superfluid. In our system, bosons are subjected to a pair of Raman laser beams that induces spin-orbit coupling, while fermions are not coupled to the Raman laser. We show that the fermions can acquire an effective spin-orbit coupling from the spin-exchange interaction between bosons and fermions. In the regime where the boson number is more than the fermion number, we study the topological phase transition of the Fermi superfluid by monitoring the close and re-open of the energy gap, the Berry phase, and the superfluid order parameter, where the back-action to the Bose condensate is also taken into consideration. Our work provides a new way of achieve topological Fermi superfluid.

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