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Realization of Dirac semi-metal bands in a two-dimensional optical lattice with spin-orbit coupling[1] BO SONG, CHENGDONG HE, ZEJIAN REN, ELNUR HAJIYEV, QIANHANG CAI, Hong Kong Univ of Sci Tech, XIONGJUN LIU, Peking University, GYU-BOONG JO, Hong Kong Univ of Sci Tech — Spin-orbit coupling is a key mechanism to induce exotic band structures and gives rise to topological phases. In this talk, we will report our experimental realization of spin-obit coupling in a two-dimensional (2D) optical lattice, and the observation of tunable 2D Dirac semimetal band structures. We highlight the tunability of band topology in our system by showing the band inversion, manipulating the asymmetry of semimetal bands and tuning the dimensionality. Furthermore, we probe the Dirac point by monitoring the time-averaged momentum-resolved spin texture after the quench from the trivial to the Dirac semimetal bands. Our work demonstrated here provides an experimental platform to explore novel topological phases of matter for cold atoms.

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