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Finite temperature topological phase transitions and emergence of Dirac semi-metallic phases in a Kondo lattice[1] PO-HAO CHOU, LIANG-JUN ZHAI, Department of Physics, National Tsing Hua University, Taiwan, ROC, CHUNG-HOU CHUNG, Electrophysics Department, National Chiao-Tung University, Taiwan, ROC, TING-KUO LEE, Institute of Physics, Academia Sinica, Nankang, Taiwan, ROC, CHUNG-YU MOU, Department of Physics, National Tsing Hua University, Taiwan, ROC — The energy gap in Dirac materials controls the topology and critical behaviors of the quantum phase transition associated with the critical point when the gap vanishes. However, it is often difficult to access the critical point as it requires tunablity of electronic structures. Here by exploiting the many-body screening interaction of localized spins and conduction electrons in a Kondo lattice, we demonstrate that the electronic band structures in a Kondo lattice are tunable in temperature. When spin-orbit interactions are included, we find that below the Kondo temperature, the Kondo lattice is a strong topological insulator at low temperature and undergoes a topological transition to a weak topological insulator at a higher temperature T_D. At T_D, Dirac points emerge and the Kondo lattice becomes a Dirac semimetal. Our results indicate that the topological phase transition though a Dirac semi-metallic phase at finite temperatures also manifests profound physics and results in critical-like behavior both in magnetic and transport properties near T_D.

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