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Landau level splitting in Cd_3As_2 under high magnetic fields CHENG ZHANG, JUNZHI CAO, SIHANG LIANG, State Key Laboratory of Surface Physics and Department of Physics, Fudan University, Shanghai 200433, China, ZHENGCAI XIA, LIANG LI, Wuhan National High Magnetic Field Center, Huazhong University of Science and Technology, Wuhan 430074, China, FAXIAN XIU, State Key Laboratory of Surface Physics and Department of Physics, Fudan University, Shanghai 200433, China — Three-dimensional (3D) topological Dirac semimetals (TDSs) are a new kind of Dirac materials that adopt nontrivial topology in band structure and possess degenerated massless Dirac fermions in the bulk. It has been proposed that TDSs can be driven to other exotic phases like Weyl semimetals, topological insulators and topological superconductors by breaking certain symmetries. Here we report the first transport evidence of Landau level splitting in TDS Cd_3As_2 single crystals under high magnetic fields, suggesting the removal of spin degeneracy by breaking time reversal symmetry (TRS). The observed Landau level splitting is originated from the joint contributions of orbit and Zeeman splitting in Cd_3As_2. In addition, the detected Berry phase is found to vary from nontrivial to trivial at different field directions, revealing a fierce competition between the orbit-coupled field strength and the field-generated mass term. Our results demonstrate a feasible path to generate a Weyl semimetal phase based on the TDSs by breaking TRS.

Cheng Zhang
State Key Laboratory of Surface Physics and Department of Physics,
Fudan University, Shanghai 200433, China

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