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Gate-tunable quantum oscillations in ambipolar Cd3As2 thin films YANWEN LIU, CHENG ZHANG, XIANG YUAN, TANG LEI, CHAO WANG, Fudan Univ, DOMENICO DI SANTE, SILVIA PICOZZI, CNR-SPIN, LIANG HE, Nanjing University, AWADHESH NARAYAN, STEFANO SANVITO, Trinity College, RENCHAO CHE, FAXIAN XIU, Fudan Univ — Cd3As2, a three-dimensional (3D) analog of graphene with extraordinary carrier mobility, was predicted to be a 3D Dirac semimetal, a feature confirmed by recent experiments. Here we report on the first observation of a gate-induced transition from band conduction to hopping conduction in single-crystalline Cd3As2 thin films via electrostatic doping by solid electrolyte gating. The extreme charge doping enables the unexpected observation of p-type conductivity in a 50-nm-thick Cd3As2 thin film grown by molecular beam epitaxy. More importantly, the gate-tunable Shubnikov–de Haas oscillations and the temperature-dependent resistance reveal a unique band structure and bandgap opening when the dimensionality of Cd3As2 is reduced. This is also confirmed by our first-principle calculations. The present results offer new insights toward nanoelectronic and optoelectronic applications of Dirac semimetals and provide new routes in the search for the intriguing quantum spin Hall effect in low-dimension Dirac semimetals. Reference: Y. Liu. et.al. NPG Asia Mater. **7,** e221 (2015)

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