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Thermopower and Nernst effect in the Dirac semimetal Cd_3As_2[1]
TIAN LIANG, Department of Physics, Princeton University, QUINN GIBSON, MAZHAR ALI, Department of Chemistry, Princeton University, MINHAO LIU, Department of Physics, Princeton University, ROBERT CAVA, Department of Chemistry, Princeton University, NAI PHUAN ONG, Department of Physics, Princeton University — Dirac semimetals and Weyl semimetals are 3D analogues of graphene in which crystalline symmetry protects the nodes against gap formation. Cd_3As_2 was predicted to be Dirac semimetal [1], and recently confirmed to be so by photoemission [2,3]. Here we report an interesting property in Cd_3As_2 that was unpredicted, namely a remarkable protection mechanism that strongly suppresses backscattering in zero H. In single crystals, the protection results in ultrahigh mobility $\sim 9 \times 10^6$ cm^2 V^{-1} s^{-1} [4] at 5 K. Suppression of backscattering results in a transport lifetime 10^4 times longer than the quantum lifetime. The lifting of this protection by H leads to a very large magnetoresistance. Quantum oscillations in resistivity, Seebeck and Nernst, show beating effect.We discuss how this may relate to changes to the Fermi surface induced by H. [1] Wang, Z. J. et al. , Phys. Rev. B **88**, 125427 (2013). [2] Sergey, B. et al. , Phys. Rev. Lett. **113**, 027603 (2014). [3] Neupane, M. et al. , Nature Commun. **5**, 3786 (2014). [4] Tian Liang et al. , Nature Materials, in press.

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