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Inverse Perovskites - A New Platform For 3D Dirac Electron Physics A.W. ROST, IFMQ, Univ. of Stuttgart, Germany, J. KIM, Max Planck Institute for Solid State Research, Stuttgart, Germany, S. SHOTA, K. HAYAMA, Dept. of Physics, The Univ. of Tokyo, Japan, V. ABDOLAZIMI, J.A.N. BRUIN, C. MUEHLE, A. SCHNYDER, A.N. YARESKO, J. NUSS, H. TAKAGI, Max Planck Institute for Solid State Research, Stuttgart, Germany — 3D Dirac semimetals show a wealth of phenomena including ultrahigh mobility, extreme transverse magnetoresistance and potential for negative longitudinal magnetoresistance. Furthermore, by introducing a gap these are often found to be topological crystalline insulators. Here, I will introduce our experiments on a new family of 3D Dirac materials – the inverse perovskites A_3BO (A=Ca,Sr,Eu/B=Pb,Sn). These open up the possibility to chemically control the properties of Dirac electrons including (i) the anisotropy of the Dirac dispersion, (ii) role of spin orbit coupling, and (iii) magnetism. Our physical property measurements show all $(Ca/Sr)_3(Pb/Sn)O$ compounds host Dirac electrons at the Fermi energy with no other bands crossing E_F. Quantum oscillations unveil small Fermi surfaces (frequencies <5 T) and light carriers (<0.02 m_e) only consistent with Dirac electrons. With the successful synthesis of $Sr_3Pb_{0.5}Sn_{0.5}O$ this group of materials therefore offers a unique chemical control over the physical properties of 3D Dirac electrons. Crucially, $Eu_3(Pb/Sn)O$ compounds allow for the introduction of magnetism. I will discuss the implications of this in particular with respect to surface states in these topological crystalline insulators.

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