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Influence of Mn substitution on the topological metal Zr_2Te_2P[1]
OLATUNDE OLADEHIN, KEKE FENG, Florida State University, KAYA WEI, YAN XIN, RYAN BAUMBACH, National High Magnetic Field Laboratory — The ternary tetradymite Zr_2Te_2P has been shown to host an unusual band structure, including (i) conventional electronic bands, (ii) a Dirac point at 400 meV above the Γ point, and (iii) a Dirac nodal arc at 700 meV below the M point[1,2]. This invites further studies to access these novel bands (e.g., by adjusting the Fermi energy) and to introduce additional interactions (e.g., through chemical substitution of magnetic ions). Here we present results from a study where a small concentration of Mn is substituted into Zr_2Te_2P. X-ray diffraction and chemical analysis (EDS) measurements show that the crystals formed in expected structure and the Mn is present in concentrations of a few percent. Magnetization measurements reveal Curie Weiss behavior that is consistent with the Mn ions being in the divalent state. Fits to the data also indicate a ferromagnetic spin exchange along the c-axis and antiferromagnetic exchange in the ab plane, that is likely mediated by the RKKY interaction. At low temperatures we find evidence for a bulk disordered spin-glass phase, which is evident in the magnetic susceptibility, heat capacity, and electrical resistivity. [1] K.W chen., et al. Phys. Rev. B 97, 165112 (2018). [2] J. Dai., et al. Phys. Rev. Lett 126, 196407 (2021)

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Oladehin Olatunde
Florida State University

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