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Superconductivity near a 3-Dimensional Dirac Semimetal: Topological Crystalline Insulator $(Pb_{1-x}Sn_x)_{1-y}In_yTe$ near the Inversion Transition[1] TONICA VALLA, I. PLETIKOSIC[2], Brookhaven Natl Lab, T. YILMAZ, University of Connecticut, A.P. WEBER, R.D. ZHONG, G.D. GU, Brookhaven Natl Lab, B. SINKOVIC, University of Connecticut — Superconductivity in topological insulators is expected to show very unconventional features such as $p + ip$ order parameter, Majorana fermions etc... However, so far, the intrinsic superconductivity has been observed only in Cu-intercalated Bi_2Se_3, where due to strong inhomogeneities, the pairing symmetry is still a matter of debate. Here, we show that in the topological crystalline insulator (TCI) $(Pb_{1-x}Sn_x)_{1-y}In_yTe$, superconductivity occurs near the gap inversion transition, when the system is nearly a 3D Dirac semimetal (DSM). The existence of superconductivity near the 3D DSM is highly unusual. We suggest that it is related to an intrinsic instability of a 3D DSM in $(Pb_{1-x}Sn_x)_{1-y}In_yTe$ and "flattening" of the bulk valence (conduction) band on the inverted, TCI side of the phase diagram that favors the pairing instability if the chemical potential is pinned to these flat regions.

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