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Characterization of the Heavy Metal Pyrochlore Lattice Superconductor CaIr2[1] NEEL HALDOLAARACHCHIGE, QUINN GIBSON, LESLIE SCHOOP, HUIXIA LUO, ROBERT CAVA, Princeton University — Compounds based on 5d transition metals are of recent interest because electron correlations and spin-orbit interactions play an important role in determining their electronic properties. Iridium oxides with the pyrochlore lattice, in particular, are predicted to host exotic electronic states, but these materials have not yet been shown to host superconductivity. A handful of Ir compounds are known to be superconducting, some more likely showing this property due to the presence of rare earths, but in other cases the superconductivity is derived from Ir states at the Fermi Energy. Here we report the synthesis, experimental electronic characterization, and calculated electronic band structure of the cubic Laves phase superconductor CaIr2. The inferred electron-phonon coupling constant show that CaIr2 is a weakly coupled BCS-type superconductor. The electronic band structure calculations indicate that the Ir d states are dominant through the Fermi level. Given the profound effect of spin-orbit coupling on the electronic structure, it can be argued that the value of Tc, and possibly even the existence of superconductivity at all, is due to the heavy element character imparted to this material by the Ir pyrochlore lattice.

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Neel Haldolaarachchige
Princeton University

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