Ce$_2$Pt$_2$Pb: Frustrated heavy fermion system with the Shastry-Sutherland lattice

MOO SUNG KIM, Brookhaven National Laboratory, MEIGAN ARONSON, Brookhaven National Laboratory, Stony Brook University — We have synthesized single crystals of Ce$_2$Pt$_2$Pb which has the Shastry-Sutherland lattice network of Ce-ions on the crystallographic c-plane, that can induce magnetic frustration. The specific heat, magnetic susceptibility, and resistivity were measured for as-grown crystals. Above 30 K, Curie-Weiss behavior is found in the magnetic susceptibility, with a Ce moment of 2.33 $\mu_B$/Ce and a Weiss temperature of -15 K, indicating antiferromagnetic interactions among the Ce$^{3+}$ ions. The magnetic specific heat rises from a minimum at 15 K to a broad maximum at 2 K, before falling to a heavy fermion value of $\sim$0.8 J/Ce-molK$^2$ at the lowest temperature. The entropy reaches only 1/2Rln2 at the maximum in the specific heat, and the full doublet ground state Rln2 is only recovered at 15 K. Ce$_2$Pt$_2$Pb is an unusual material, in which a heavy fermion liquid with short range antiferromagnetic order emerges from a strongly frustrated and fluctuating paramagnetic state.