Title:	Possible multigap type-I superconductivity in the layered boride RuB 2
Authors:	Singh, Jaskaran. (/jspui/browse?type=author&value=Singh%2C+Jaskaran.) Jayaraj, Anooja (/jspui/browse?type=author&value=Jayaraj%2C+Anooja) Srivastava, Deepansh (/jspui/browse?type=author&value=Srivastava%2C+Deepansh) Gayen, Sirshendu (/jspui/browse?type=author&value=Gayen%2C+Sirshendu) Singh, Yogesh (/jspui/browse?type=author&value=Singh%2C+Yogesh)
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Abstract:	The structure of the layered transition-metal borides AB2(A=Os,Ru) is built up by alternating T and B layers with the B layers forming a puckered honeycomb. Here we report superconducting properties of RuB2 with a Tc≈1.5 K using measurements of the magnetic susceptibility versus temperature T, magnetization M versus magnetic field H, resistivity versus T, and heat capacity versus T at various H. We observe a reduced heat capacity anomaly at Tc given by ΔC/γTc≈1.1 suggesting multigap superconductivity. Strong support for this is obtained by the successful fitting of the electronic specific heat data to a two-gap model with gap values Δ1/kBTc≈1.88 and Δ2/kBTc≈1.13. Additionally, M versus H measurements reveal a behavior consistent with type-I superconductivity. This is confirmed by comparing the experimental critical field ≈122 Oe obtained from extrapolation to T=0 of the H-T phase diagram, with an estimate of the T=0 thermodynamic critical field ≈114 Oe. Additionally, the Ginzburg-Landau parameter was estimated to be κ≈0.1-0.66. These results strongly suggest multigap type-I superconductivity in RuB2. We also calculate the band structure and obtain the Fermi surface for RuB2. The Fermi surface consists of one quasi-two-dimensional sheet and two concentric ellipsoidal sheets very similar to OsB2. An additional small fourth sheet is also found for RuB2. RuB2 could thus be an example of a multigap type-I superconductor.
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