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Zr_5Sb_3-first Superconductor in the Mn_5Si_3-type system BING LV, X.Y. ZHU, B. LORENZ, F.Y. WEI, Y.Y. XUE, TcSUH and Dept. of Physics, University of Houston, Z.P. YIN, G. KOTLIAR, Dept. of Physics and Astronomy, Rutgers University, C.W. CHU, TcSUH and Dept. of Physics, University of Houston; Lawrence Berkeley National Laboratory — Systematic exploration for superconductivity in the Zr_5X_3 (x=Sb, Sn, Ge, Ga, and Al) system have been carried out, and we report the discovery of superconductivity at 2.3 K in Zr_5Sb_3, the first superconducting member in the large compound family of the Mn_5Si_3-structure type. Transport, magnetic, and calorimetric measurements clearly demonstrate the bulk superconductivity for the Zr_5Sb_3 and band structure calculations suggest it to be a possible phonon-mediated BCS superconductor, with a relatively large density of states at the Fermi level associated with the d-electrons of Zr and substantially larger electron-phonon coupling compared to the Sn counterpart compound Zr_5Sn_3. Detailed doping studies have shown that superconductivity in Zr_5Sb_3 is rather robust with Hf- and Y-substitution of Zr, but suppressed by Ti-substitution. It is also suppressed by interstitial filling in Zr_5Sb_3Z by Z = Sb, C, or O.

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