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Comparative Studies of Quasi-One-Dimensional Superconductivity in $Sc_5Ir_4Si_{10}$ and $Lu_5Ir_4Si_{10}$ TSUYOSHI TAMEGAI, GUOJI LI, Department of Applied Physics, The University of Tokyo — Compounds with a formula $R_5T_4X_{10}$ (R=Sc, Y, rare earth elements, T=Co, Ir, Rh, Os, X=Si, Ge) crystallize in $Sc_5Co_4Si_{10}$–type structure with Sc-Si chains running along the c-axis. Some of them show superconductivity with relatively high transition temperatures and coexistence of superconductivity and charge-density wave. We have grown high quality single crystals of $Sc_5Ir_4Si_{10}$and $Lu_5Ir_4Si_{10}$ using the floating-zone method. Thus obtained crystals show superior properties compared with polycrystalline materials, such as higher T_c and H_{c2}. Anisotropic superconducting properties in these crystals are studied in detail. The upper critical field shows clear anisotropy, with $H_{c2}^c > H_{c2}^{ab}$, consistent with the quasi-one-dimensional crystal structure. Both compounds have modest anisotropies with $\gamma(= H_{c2}^c/H_{c2}^{ab})$=2.3 for $Sc_5Ir_4Si_{10}$ and γ=1.6 for $Lu_5Ir_4Si_{10}$. Magnetic penetration depths in $Sc_5Ir_4Si_{10}$ (λ_c= 900 A and λ_{ab} =2100 A) estimated from the magnetic field dependence of the equilibrium magnetization confirm quasi-one-dimensional nature of the superconducting state.

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