

Uniformity of Critical Current Density for 4cm Size YBa₂Cu₃O_{7- δ} Single Crystals

Insun Jo^a, Heon-Jung Kim^a, Jung-Dae Kim^a, Sung-Ik Lee^a, Sang-Chul Han^b, Young-Hee Han^b,
and Tae-Hyun Sung^b

^a Pohang University of Science and Technology, Pohang, Korea

^b Korea Electric Power Research Institute, Daejeon, Korea

Top seeded melt growth method was adapted to grow 40 x 40 x 15mm³ size YBa₂Cu₃O_{7- δ} single crystals with high quality. We investigate the critical current density while applying the magnetic field parallel to CuO₂ plane for this parallelepiped single crystal. The main focus of this research is whether different spots in these large crystals show homogeneous superconducting properties or not. The information extracted from 5 different spots showed no significant J_c difference except at the center and the corners. The measured J_c with order of 10⁶A/cm² at 5K for this 4 cm size single crystal is comparable to the best results of J_c for the 1 mm size single crystals. The maintaining of the high superconducting quality for this large single crystal indicate that this single crystal could be significantly useful for the large scale application such as superconducting bearing or the flying wheel system.

Keywords : YBCO single crystal, critical current density, critical state model, high temperature superconductor