

INVITED

HT_c Bulk Superconductors and Applied Superconductivity

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Recently, the R&D of *HTc* (high critical temperature) bulk superconductors made progress very much in advanced countries. The major applications of high-temperature superconductors have mostly been confined to products in the form of wires and thin films. However, recent developments show that rare-earth REBa₂Cu₃O_{7-x} and light rare-earth LREBa₂Cu₃O_{7-x} superconductors prepared by melt processes have a high critical current density (J_c) at 77 K and high magnetic fields.

As is well known, a high critical current density and a large bulk size, which is related to current loop size are the essential requirements for engineering applications of RE123 superconducting bulks. A trapped magnetic field of larger than 3T at 77 K was achieved, and a superconducting magnet with a trapped magnetic field of 17T at 29K was developed. These specifications are much better than performances of permanent magnets. In addition, superconducting bulk conductors which can carry several thousands Ampere at 77K have been developed and practically important mechanical properties also have improved very much.

These superconductors will promote the application of high-temperature bulk superconductors in high magnetic fields. It is considered that application fields will largely extend, not only in electric power, also in transportation, environment, industries with progress in materials technology of *HTc* bulk superconductors. Electric devices, such as Flywheel energy storage equipment, Motors, Generators, Linear actuators and applications to Magnetic separation and Magnetically levitated trains have been proposed. In addition, as conductor applications of *HTc* bulk superconductors, applications to current leads of superconducting magnets and FCL (Fault Current Limiters) are proposed.

In this study, we discuss the current R&D status and future trend of technologies on *HTc* bulk superconductors and applied superconductivity with up to date results.

Keywords : *HTc* superconductor, Bulk, REBaCuO, melt texture, characterization, applied superconductivity