

## Superconducting Properties of Top-seeded Melt Growth Processed $\text{YBa}_2\text{Cu}_3\text{O}_x$ Superconductors with Calcium Doping

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Effects of Calcium-doping on the superconducting properties of top seeded melt growth (TSMG) processed  $\text{YBa}_2\text{Cu}_3\text{O}_{7-y}$  superconductors were investigated. At first, precursor powder ( $\text{YBa}_{2-x}\text{Ca}_x\text{Cu}_3\text{O}_{7-y}$  (Y123) with  $0.005 \leq x \leq 0.01$ ) were synthesized by the solid state reactions and then single grain bulk superconductors were fabricated by a seeded melt growth process using the precursor powders. Phase formation and superconducting properties were estimated by powder X-ray diffraction and SQUID magnetometer. The superconducting temperatures ( $T_c$ ) of the Y123 samples with  $x=0.005$  and  $0.01$  were 89.56K, 89.05K slightly lower than  $T_c$  of 91K of undoped samples, which is ascribed to the substitution of calcium to Y123 lattices. Anomalous peak effect in the intermediate magnetic fields of 2-4 T was observed in Ca-doped samples. The critical current density ( $J_c$ ) at 77 K of the samples with  $x=0, 0.005$  and  $0.01$  were  $1.1 \times 10^4 \text{ A/cm}^2$ ,  $6.3 \times 10^4 \text{ A/cm}^2$  and  $4.0 \times 10^4 \text{ A/cm}^2$ , respectively. It suggests that the superconducting properties regarding flux pinning can be enhanced by calcium doping.

Keywords:  $\text{YBa}_2\text{Cu}_3\text{O}_{7-y}$ , Ca-doping, Melt growth process, Critical current density, Peak effect