

Effect of Uniaxial Pressure on Superconducting Properties of YBCO Thick Films

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YBa₂Cu₃O_x (YBCO) superconducting thick films were fabricated on Cu substrates, using a simple screen-printing method, from Cu-free powders (Y₂O₃ and BaCO₃). However, the films have poor superconducting properties, such as critical current density, J_c value due to the low film density.

In this work, we investigate the effect of a uniaxial c-axis pressure on superconducting properties of the YBCO films using a Spark Plasma Sintering (SPS) technique. The film screen-printed on Cu substrates was heat-treated at 850 °C 5 min in vacuum by varying the pressure (15, 30, and 45 MPa). To form a superconducting YBCO phase, the film was reheat-treated at 930 °C for 30 sec in air followed by oxygen annealing at 450 °C for 1 hr. As the heat-treatment was performed under the pressure, lower porosity of the film was obtained, and higher crack density of the film was also observed. The densification of YBCO thick films using the SPS technique was very effective in improving the superconducting properties of the films.

Keywords : YBCO, thick films, spark plasma sintering, densification, Cu substrates