

# Study on fabrication of oxide high temperature superconducting films using precursors

2006

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The fabrication of  $\text{REBa}_2\text{Cu}_3\text{O}_y$  (RE123) superconducting films from precursors prepared by metal-organic deposition (MOD) technique and  $\text{BaF}_2$  process using electron beam deposition method has been studied. These techniques are suitable for mass production of RE123 superconducting wires from a point of view of high reproductivity and low-cost production.

In order to select the most suitable RE123 material for superconducting applications, RE123 (RE = Yb, Er, Ho, Dy, Gd, Eu, Sm, Nd, La) films were prepared by the MOD technique using naphthenates as starting materials and the crystal orientation behavior and superconducting properties were investigated. Yb123, Er123 and Gd123 films grown on  $\text{SrTiO}_3$  substrates showed  $T_c$  of 89.5 K, 89.7 K and 91.8 K, respectively. Gd123 films showed in-plane aligned  $c$ -axis orientation at wider temperature range than the other RE123 films. Therefore, the Gd123 film is expected to be a primary candidate in the RE123 films prepared by MOD technique because of high  $T_c$  and wide firing temperature ranges.

Gd123 films were also successfully fabricated by the  $\text{BaF}_2$  process without introduction of water vapor, which showed  $T_c$  of 93.4 K and  $J_c$  of  $2.12 \text{ MA cm}^{-2}$ . It was found that the Gd123 films had wider process window than Y123 films in the  $\text{BaF}_2$  process. The  $\text{BaF}_2$  process without water vapor has advantages for industrial production from a viewpoints of fewer control parameters and high uniformity of superconducting properties.