

Effect of size, morphology and crystallinity of seed crystal on single domain YBa₂Cu₃O_{7-y} nucleation and growth

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Abstract

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The effect of size, morphology and crystallinity of seed crystals on the nucleation and growth of the YBa₂Cu₃O_{7-y} (Y-123) phase in the seeded melt growth of Y-Ba-Cu-O (YBCO) bulks is investigated. Seeding bulk samples with small, square shape seed crystals leads to point nucleation and growth of the Y-123 phase which exhibits the usual square habitual growth symmetry. The use of a rectangular seed crystal, however, yields direct epitaxial growth of the Y-123 phase at the bottom surface of the seed crystal. A large surface area seed crystal of 20 mm x 10 mm gives rise to epitaxial nucleation and results in the growth of a single grain growth free of secondary nuclei. The present study is particularly relevant to seeding complex-shaped bodies for single domain applications, for fabricating samples that contain no growth sectors, for decreasing the processing times of large grain YBCO bulks and for multiple seeding of large grain samples that do not contain grain boundaries.