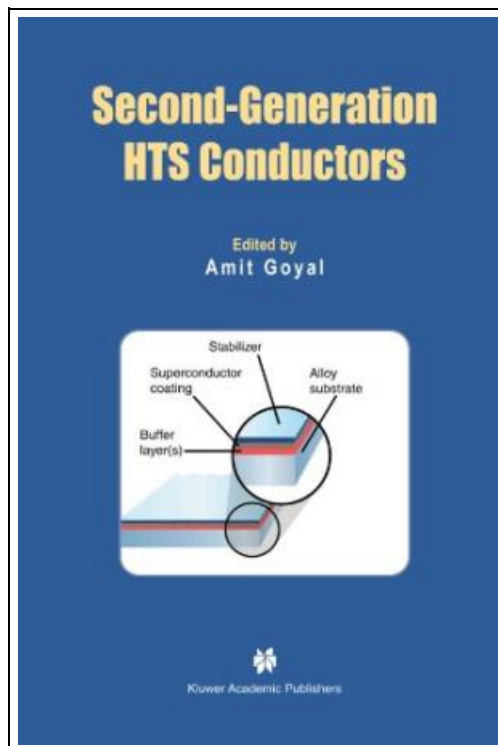


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SECOND-GENERATION HTS CONDUCTORS (PAPERBACK)

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Springer-Verlag New York Inc., United States, 2010. Paperback. Condition: New. Language: English . Brand New Book ***** Print on Demand *****.The discovery of high temperature superconductors (HTS) in 1986 by two IBM scientists led to an unprecedented explosion of research and development efforts world-wide because of the significant potential for practical applications offered by these materials. However, the early euphoria created by the exciting prospects was dampened by the daunting task of fabricating these materials into useful forms with acceptable superconducting properties. Progress toward this goal has been hindered by many intrinsic materials problems, such as weak-links, flux-creep, and poor mechanical properties. The earliest studies of critical current density J_c in HTS materials revealed that for a polycrystalline material containing a distribution of grain boundaries is much lower than that for a single crystal. High angle grain boundaries act as Josephson coupled weak-links leading to a significant field-dependent suppression of the supercurrent across the boundary. For clean stoichiometric boundaries, the grain boundary critical current density depends primarily on the grain boundary misorientation. The dependence of J_c (gb) on misorientation angle has been determined for $YBa_2Cu_3O_{7-x}$ (YBCO) in boundary types which can be formed in epitaxial films on bicrystal substrates. These include [001] tilt, [100] tilt, and [100] twist boundaries. In each case high angle boundaries were found to be weak-linked. These experiments have also been extended to artificially fabricated [001] tilt bicrystals in $TlBaCaCuO$, $TlBaCaCuO_{22282223}$ x $TlBaCaCuO$ (Tl-1223) and $NdCeCuO$. In each case it was found that, as in YBCO, J_c depends strongly on grain boundary misorientation angle. Data on J_c current transmission across artificially fabricated grain boundaries in Bi-2212 also indicate that most large angle [001] tilt and [001] twist boundaries are weak links. It is likely that the variation in J_c with grain boundary misorientation is similar in all high-T superconductors. Hence, the low J_c observed in randomly oriented polycrystalline HTS can be understood on the basis that the population of low angle boundaries is small and that frequent high angle boundaries impede long-range current flow. Using conventional processing techniques, three HTS materials were successfully fabricated in polycrystalline form with modest J_c s. These are the Bi-2223 powder-in-tube conductors, the Tl-1223 spray-pyrolyzed films and the Bi-2212 melt-processed thick films. These three types of conductors comprised the First-Generation HTS conductors or wires. Softcover reprint of hardcover 1st ed. 2005.



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