

Inductive Determination of Inter- and Intra-Grain Critical Current Densities of $\text{YBa}_2\text{Cu}_3\text{O}_{7-x}$ IBAD and RABiT Coated Conductors

A. Palau¹, T. Puig¹, X. Obradors¹, E. Pardo², C. Navau², A. Sanchez², Ch. Jooss³, A. Usoskin³, H. C. Freyhardt³, L. Fernández⁴, B. Holzapfel⁴, R. Feenstra⁵

¹Institut de Ciència de Materials de Barcelona, CSIC, Campus de la UAB, 08193 Bellaterra, Spain

²Grup d'Electromagnetisme, Universitat Autònoma de Barcelona, 08193 Bellaterra, Spain

³Zentrum für Funktionwerkstoffe, 37073 Göttingen, Germany

⁴IFW Dresden, 01069 Dresden, Germany

⁵Oak Ridge National Laboratory, Oak Ridge, Tennessee 37831-6057

European Conference on Applied Superconductivity (EUCAS)
Sorrento, Italy
September 14-18, 2003

"The submitted manuscript has been authored by a contractor of the U.S. Government under contract No. DE-AC05-00OR22725. Accordingly, the U.S. Government retains a nonexclusive, royalty-free license to publish or reproduce the published form of this contribution, or allow others to do so, for U.S. Government purposes."

prepared by
SOLID STATE DIVISION
OAK RIDGE NATIONAL LABORATORY
Managed by
UT-BATTELLE, LLC
under
Contract No. DE-AC05-00OR22725
with the
U.S. DEPARTMENT OF ENERGY
Oak Ridge, Tennessee

April, 03

Inductive Determination of Inter- and Intra-Grain Critical Current Densities of $\text{YBa}_2\text{Cu}_3\text{O}_{7-x}$ IBAD and RABiT Coated Conductors

A. Palau¹, T. Puig¹, X. Obradors¹, E. Pardo², C. Navau², A. Sanchez², Ch. Jooss³, A. Usoskin³, H.C. Freyhardt³, L. Fernández⁴, B. Holzapfel⁴, R. Feenstra⁵

¹Institut de Ciència de Materials de Barcelona, CSIC, Campus de la UAB, 08193 Bellaterra, Spain

²Grup d'Electromagnetisme, Universitat Autònoma de Barcelona, 08193 Bellaterra, Spain

³Zentrum für Funktionwerkstoffe, 37073 Göttingen, Germany

⁴IFW Dresden, 01069 Dresden, Germany

⁵Oak Ridge National Laboratory, Oak Ridge, Tennessee 37831-6057

High critical current coated conductors emerged as a potential material for high field power applications. However, magneto-optic flux imaging and critical transport measurements have demonstrated the percolative nature of supercurrent flow through their low angle grain boundaries. The effects derived from the granular character of these materials have become crucial issues for the understanding and achievement of good quality material for applications.

We present a non-invasive inductive analysis of YBCO IBAD and RABiT coated conductors which enable us to analyze the electromagnetic granularity inherent to these materials. The method, based on the return flux at the grain boundaries, identifies clearly the presence of electromagnetic granularity from the appearance of a peak in the return branch of the irreversible magnetization. Hysteresis minor loop cycles reveal the evolution of this peak and allow us to separate and analyze independently the inter- and intra-grain critical current density of the two types of coated conductors. The method is envisaged to sort out granularity effects from vortex pinning effects on coated conductors.