

A.V. Narlikar (Ed.)

High Temperature Superconductivity 1

Materials



Springer

CONTENTS

<i>Contributors</i>	v
<i>Preface</i>	xiii

MATERIALS ASPECTS OF HIGH TEMPERATURE SUPERCONDUCTORS FOR APPLICATIONS

Roland HOTT

Introduction	1
Atomic Structure and Classification	2
Structural Obstacles for Supercurrents	5
Technically Applicable HTS Materials	8
Thin Films	9
Josephson Junctions	10
Wire and Tape Conductors	12
Bulk Materials	16
Conclusion	17
References	18

FASCINATING THALLIUM-BASED SUPERCONDUCTING CUPRATES AND SUBSYSTEMS : FORMATION AND STABILITY

Jean-Louis JORDA, Philippe GALEZ, Sovannary PHOK, Thomas HOPFINGER, and
Timoth  Koffi JONDO

Introduction	29
Basics for Solid State Reaction Kinetics	31
The Single Cation Systems for Superconducting Cuprates	31
The Binary and Ternary Cation Systems	36
Phase Equilibrium for Superconducting Thallium Cuprates	47
Reaction Pathway and Kinetics for the Formation of the Thallium Cuprates	59
Conclusion	69
References	72

MELT PROCESSED RE-Ba-Cu-O BULK SUPERCONDUCTORS

Hiroshi IKUTA

Introduction	79
Processing and Characterization	80
Materials	85
Magnetization	97
Summary	107
References	108

COATED CONDUCTORS AND HTS MATERIALS BY CHEMICAL DEPOSITION PROCESSES

Sandrine BEAUQUIS, Carmen JIMENEZ and Fran ois WEISS

Introduction	115
Bi-axially Textured Substrate Preparation	117
Chemical Deposition Processes for Coated	

Conductors: Basic Principles and Main Results	128
Process-Related Technical Issues	155
Summary	157
Glossary	159
References	160

TiBaCaCuO SUPERCONDUCTING THIN FILMS BY AN EX-SITU MOCVD BASED APPROACH: FROM BaCaCuO(F) MATRICES TO DEVICES

Graziella MALANDRINO and Ignazio L. FRAGALA’.

Introduction	169
Experimental Procedures	172
Results and Discussion	173
Conclusions	206
References	207

Hg-BASED SUPERCONDUCTING THIN FILMS FOR DC SQUIDS BY IMPROVED FABRICATION PROCESS

N. INOUE, A. TSUKAMOTO, Y. MORIWAKI, T. SUGANO, X. -J. WU, A. OGAWA,
S. ADACHI, K. TAKAGI and K. TANABE

Introduction	213
Thin Film Fabrication	214
Bi-crystal Junction	226
DC SQUID	231
Concluding Remarks	234
References	235

HIGH-T_c SUPERCONDUCTING CONDUCTORS FOR AC AND DC APPLICATIONS

Bartek A. GLOWACKI

Introduction	239
REBa ₂ Cu ₃ O ₇ Conductors	242
Bi ₂ Sr ₂ CaCu ₂ O _{8+x} Conductors	268
References	276

FABRICATION AND PROPERTIES OF AG/Bi(2223) SQUARE WIRES AND ITS APPLICATION

X.D. SU, G WITZ, K. KWASNITZA and R. FLUKIGER

Introduction	281
Experimental	282
Results and Discussion	282
Conclusions	290
References	290

PROGRESS OF HIGH-T_c WIRES AND ITS APPLICATIONS

Yutaka YAMADA and Yuh SHIOHARA

Introduction	291
Superconducting Wires	292
Applications	321
Task for Industrialization	331
Conclusions	332
References	333

ELECTRICAL INSULATION FOR SUPERCONDUCTING POWER APPARATUS

Naoki HAYAKAWA and Hitoshi OKUBO

Introduction	339
Fundamentals for Electrical Insulation Test and Analysis at Cryogenic Temperature	341
Area and Volume Effects on Dielectric Strength	346
V – t Characteristics	355
Electrical Insulation under Thermal and Electrical Combined Stress	359
Flow Chart for Electrical Insulation Design of Superconducting Power Apparatus	372
References	374

MODELING CURRENT FLOW IN GRANULAR SUPERCONDUCTORS AND IMPLICATIONS FOR POTENTIAL APPLICATIONS

N. A. RUTTER and A. GOYAL

Introduction	377
Coated Conductor Models	378
Development of a New Model	383
Modeling Results	388
References	398

CRITICAL CURRENT DENSITY, FLUX PINNING AND MICROSTRUCTURE IN MgB₂ SUPERCONDUCTORS

Y. FENG , Y. ZHAO, G. YAN, A.K. PRADHAN, L. ZHOU, N. KOSHIZUKA and M.
MURAKAMI

Introduction	401
Thermodynamic Behavior and the Phase Formation in Mg-B System	403
Effect of Zr Doping on Superconducting	

Properties and Microstructure in MgB_2 Superconductors	407
Transport Behavior, Flux Pinning and Microstructure in $\text{MgB}_2/\text{Ta}/\text{Cu}$ Wires	413
Improvement of J_c in MgB_2 Tapes by Ti- Doping	419
High Critical Current Density and Microstructure in MgB_2/Fe Wires	422
Conclusion	426
References	427

AC LOSSES UNDER SELF-FIELD IN A SUPERCONDUCTING TUBE

Jean LEVEQUE, Bruno DOUINE, Denis NETTER

Introduction	431
Modelling of the Problem	433
Studied Samples	449
Calculation of Losses in Incomplete Penetration	451
Calculation of Losses on Complete Penetration	464
Experimental Study of Losses	478
Conclusion	492
References	493
Nomenclature	495

<i>Subject Index</i>	497
----------------------	-----