

# Contents of Volume 1

## 1 Plenary Lectures

---

High $T_c$ Electronics Products — A Materials Success Story J.M. ROWELL .....	3
Status and Future Prospects of High Current Superconductivity P. KOMAREK .....	9
Superconductivity of Layered Perovskite $Sr_2RuO_4$ Y. MAENO .....	15
Boson Physics and Vortex Pinning via Splayed Columnar Defects in Superconductors D.R. NELSON .....	21
Progress in the Use of SQUIDS for Electromagnetic Nondestructive Evaluation G.B. DONALDSON, A. COCHRAN, J. KUZNIK, D.M. MCKIRDY, C. CARR ..	27
Crystal Growth Aspect of High- $T_c$ Superconductors T. NISHINAGA, H.J. SCHEEL .....	33

## 2 Physics

---

### 2.1 Tunneling and Electron Spectroscopy

---

Tricrystal Tests of Pairing Symmetry in Cuprate Superconductors C.C. TSUEI, J.R. KIRTLEY, M. RUPP, J.Z. SUN, C.C. CHI, A. GUPTA, L.S. YU-JAHNES, M.B. KETCHEN .....	43
Surface Atomic Structure of As-Prepared $Nd_1Ba_2Cu_3O_y$ Single Crystals Characterized Using an UHV-STM System W. TING, T. EGLI, R. ITTI, K. KURODA, N. KOSHIZUKA .....	49
Quantum Fluctuations of the Phase Near the S-I Transition in 2D S. OKUMA, T. ARAI .....	53
Photoemission and Inverse-Photoemission Studies on Metal-Insulator Transition of Bi-2201 Ceramics N. SANADA, Y. SUZUKI, M. SHIMOMURA, Y. FUKUDA, M. NAGOSHI, H. NAMEKI, Y. SYONO, M. TACHIKI .....	57

### 2.2 Transport and Thermal Properties

---

The Low Temperature Properties of Overdoped $Tl_2Ba_2CuO_{6+\delta}$ A.P. MACKENZIE, S.R. JULIAN .....	63
---	----

Thermopower of YBCO and BSCCO Single Crystals J.W. COCHRANE, A. HARTMANN, G.D. GU, P.A. MILES, G.J. RUSSELL, N. KOSHIZUKA .....	69
Dependence of $T_c$ on Hydrostatic and Uniaxial Pressure for Single Crystal of $\text{Bi}_2\text{Sr}_2\text{CaCu}_2\text{O}_{8+\delta}$ Y. UEDA, H. TSUNEMATSU, N. WATANABE, K. TSUSHIMA, N. MÔRI .....	73
Ni-Substitution Effect of Single Crystalline $\text{Bi}_2\text{Sr}_2\text{CaCu}_2\text{O}_{8+\delta}$ K. UENO, H. IKEDA, R. YOSHIZAKI .....	77
Characterization of Heavily Ca Doped $\text{Y}_{1-x}\text{Ca}_x\text{Ba}_2\text{Cu}_3\text{O}_{7-d}$ Thin Films H. YAKABE, I. TERASAKI, M. KOSUGE, Y. SHIOHARA, N. KOSHIZUKA .....	81
Hall Effect and Magneto Resistance of $\text{Y}_{0.5}\text{Ca}_{0.5}\text{Ba}_2\text{Cu}_3\text{O}_{7-\delta}$ Thin Film in the Mixed State H. YAKABE, K. NAKAO, Y. SHIOHARA, N. KOSHIZUKA .....	85
Thermomagnetic Effect in $\text{YBa}_2\text{Cu}_3\text{O}_y$ Single Crystals Y. SATO, I. TERASAKI, S. TAJIMA .....	89
Electrical Resistivities of $\text{PrBa}_2\text{Cu}_4\text{O}_8$ Under High Pressures Up to 7GPa S. HORII, Y. YAMADA, T. KOSAKA, Y. OKADA, A. MATSUSHITA, T. MATSUMOTO, N. MÔRI, I. HIRABAYASHI, U. MIZUTANI .....	93
The Behavior of the Hall Resistivity in the Mixed State of Single Crystalline Bi-2212 L.X. CHEN, M. AKAMATSU, H. IKEDA, R. YOSHIZAKI .....	97
Electronic Transport in Insulating $\text{YBa}_2\text{Cu}_3\text{O}_y$ F.A. WAHAB, K. SHIMAKAWA, Y. MIZUSHIMA, Y. YAMADA, I. HIRABAYASHI .....	101
Superconducting Fluctuations in $\text{Bi}_2\text{Sr}_2\text{CaCu}_2\text{O}_8$ Single Crystals with Different Anisotropy S.H. HAN, Y. ZHAO, G.D. GU, G.J. RUSSELL, N. KOSHIZUKA .....	105
Giant Resistive Peak Close to the Superconducting Transition in $\text{Bi}_2\text{Sr}_2\text{CaCu}_2\text{O}_8$ Single Crystals S.H. HAN, Y. ZHAO, G.D. GU, G.J. RUSSELL, N. KOSHIZUKA .....	109

### **2.3 Magnetic Resonance, Neutron, and Mössbauer Studies**

---

Nuclear Resonance Study of Structural Features and Spin Dynamics Related to Different Oxygen Content in $\text{HgBa}_2\text{CuO}_{4+\delta}$ W. HOFFMANN, H. BREITZKE, K. LÜDERS, A.A. GIPPIUS, E.V. ANTIPOV, V.A. ALYOSHIN, H. LÜTGEMEIER .....	115
$^{57}\text{Fe}$ Mössbauer Effect Study of $\text{Bi}_2(\text{Sr,Ca,Y})_3\text{Cu}_2\text{O}_z$ H. SHIBASHI, H. MINAMIMOTO, T. HASEGAWA, K. KIMURA, H. INO .....	119
NQR Study in $\text{YBa}_2\text{Cu}_4\text{O}_8$ Under Pressure T. MACHI, M. KOSUGE, N. KOSHIZUKA, H. YASUOKA .....	123
Oxygen-Content Dependence of Magnetic Properties and Superconductivity in Ca-Rich $\text{Bi}_2\text{Sr}_1\text{Ca}_2\text{Cu}_2\text{O}_y$ H. TOKITA, H. UWE, H. ASANO .....	127

## 2.4 Optical and Ultrasonic Properties

---

Interlayer Optical Response of $\text{YBa}_2[\text{Cu}_{1-y}(\text{Co,Zn})_y]_3\text{O}_{6+x}$ S.L. COOPER, M.A. KARLOW, P.A. NYHUS, R.L. NEIMAN, J. GIAPINTZAKIS, D.M. GINSBERG, B.W. VEAL, A.P. PAULIKAS . . . . .	133
Intrinsic Josephson Coupling and Josephson Plasma in High $T_c$ Superconductors M. TACHIKI, T. KOYAMA, S. TAKAHASHI . . . . .	139
Internal Friction Processes in BSCCO Between 78K and 300K A.R. ANDERSON, G. GENDA, S. KENNEDY, P. MILES, G.J. RUSSELL, N. KOSHIZUKA . . . . .	147
A Comparative Study of Internal Friction in Pure and Iron Doped BSCCO Between 78K and 300K A.R. ANDERSON, G. GENDA, S. KENNEDY, P. MILES, G.J. RUSSELL, N. KOSHIZUKA . . . . .	151
c-Axis Optical Spectra of $\text{YBa}_2(\text{Cu}_{1-x}\text{Zn}_x)_3\text{O}_y$ Single Crystals R. HAUFF, S. TAJIMA, W.J. JANG, Y. SATO . . . . .	155
Temperature Dependence of the Phonon Frequencies and Linewidths of $\text{YBa}_2(\text{Cu}_{1-x}\text{M}_x)_4\text{O}_8$ for $M = \text{Ni}$ and $\text{Zn}$ N. WATANABE, N. KOSHIZUKA . . . . .	159
Lattice Dynamics and the Phonon Modes Observed by Raman and IR Measurements on $\text{Pr}_x\text{Ho}_{1-x}\text{Ba}_2\text{Cu}_3\text{O}_7$ System H. MAKINO, K. MATSUSHI, T. MORI, S. ONARI . . . . .	163
Photodoping Effects by Femtosecond Pulses in Insulating $\text{YBa}_2\text{Cu}_3\text{O}_{6+x}$ and $\text{Nd}_2\text{CuO}_4$ Thin Films K. MATSUDA, M. ICHIDA, A. NAKAMURA, T. NABATAME, I. HIRABAYASHI . . . . .	167

## 2.5 Magnetic and Microwave Properties

---

Low-Temperature Penetration Depth in $\text{Bi}_2\text{Sr}_2\text{CaCu}_2\text{O}_{8+y}$ from Underdoped to Overdoped Regime T. SHIBAUCHI, N. KATASE, T. TAMEGAI, K. UCHINOKURA . . . . .	173
Magnetism and Superconductivity in Single Crystalline $\text{HoNi}_2\text{B}_2\text{C}$ H. TAKEYA, T. MOCHIKU, K. HIRATA, T. HIRANO, K. KADOWAKI . . . . .	177
Evidence for Superconductivity in $\text{RuSb}$ S. EBISU, N. WADA, T. HASHIGUCHI, N. KIJIMA, S. NAGATA . . . . .	181
Microwave Absorption in the Mixed State of $(\text{Bi or Tl})_2(\text{Sr or Ba})_2\text{Ca}_{n-1}\text{Cu}_n\text{O}_y$ A. MAEDA, S. SAKAMOTO, T. HANAGURI, Y. KOTAKA, J. SHIMOYAMA, K. KISHIO, Y. MATSUSHITA, M. HASEGAWA, H. TAKEI, H. IKEDA, R. YOSHIZAKI . . . . .	185
Torque Magnetometry of Twinned $\text{YBa}_2\text{Cu}_3\text{O}_7$ Single Crystal T. ISHIDA, S. KAWAMATA, K. OKUDA, H. ASAOKA, Y. KAZUMATA, K. NODA, H. TAKEI . . . . .	189

Susceptibility of Small Superconductors below the Lower Critical Field Y. MAWATARI .....	193
Magnetic Relaxation and Second Peak of $\text{La}_{2-x}\text{Sr}_x\text{CuO}_4$ Single Crystals Y. KODAMA, K. OKA, Y. YAMAGUCHI, Y. NISHIHARA, K. KAJIMURA .....	197
Peak Effect in the Melt-Textured $\text{GdBa}_2\text{Cu}_3\text{O}_{7-y}$ Bulk Samples H. IKEDA, J. RAMIREZ-CASTELLANOS, T. KOYANO, Y. MATSUI, R. YOSHIKAZI .....	201
High Precision Magnetization and Heat Capacity Measurements of $\text{Bi}_2\text{Sr}_2\text{CaCu}_2\text{O}_y$ Single Crystals in the Mixed State T. TSUBOI, T. HANAGURI, A. MAEDA, T. NISHIZAKI, N. KOBAYASHI, Y. KOTAKA, J. SHIMOYAMA, K. KISHIO .....	205
Annealing Effects on Vortex Phase Transition of BSCCO-2212 Crystal via Magnetization Measurement Y. YAMAGUCHI, H. TOMONO, F. IGA, Y. NISHIHARA .....	209
Weak Pinning Force Constant for the Flux Motion Parallel to the ab-Plane in Bi-2212 Single Crystal N. KURODA, K. OYAMA, H. IKEDA, R. YOSHIKAZI .....	213

## 2.6 Structural Properties

---

Thermal Expansion Anomaly in High $T_c$ $\text{La}_{1.85}\text{Sr}_{0.15}\text{CuO}_4$ Associated with the Superconductivity H. MAETA, F. ONO, T. KATO, K. HARUNA, I. TANAKA, H. KOJIMA .....	219
A Study of Lattice Distortion Associated with High $T_c$ Superconductivity F. ONO, H. MAETA .....	223
Local Structure Determination in Molten YBCO Systems Using EXAFS Technique H.S. CHAUHAN, A. ENDO, Y. SHIOHARA .....	227
Local Structural Analysis of Bismuth Doped Mercury Cuprates K. NAKANISHI, M. ITO, A. TSUKAMOTO, H. YAMAUCHI, K. TANABE .....	231
Changes in the Transport Properties and the Suppression of Superconductivity in $\text{La}_{2-x-y}\text{Nd}_y\text{Ba}_x\text{CuO}_4$ at $x = 1/8$ X. BAO, Y. MAENO, Y. TANAKA, J. NYHUS, T. FUJITA .....	235
Low-Temperature Structural Transitions and $T_c$ -suppression in $\text{La}_{2-x-y}\text{Ba}_x\text{Nd}_y\text{CuO}_4$ K. ITO, Y. KOYAMA, Y. INOUE, Y. MAENO, T. FUJITA .....	239
Features of Microstructure in $\text{Sr}_2\text{RuO}_4$ Y. INOUE, M. HARA, Y. KOYAMA, Y. MAENO, T. FUJITA .....	243
Origin of Least Superconducting Anisotropy of $\text{CuBa}_2\text{Ca}_3\text{Cu}_4\text{O}_{12-y}$ (Cu-1234) Among High- $T_c$ Superconductors H. IHARA, A. IYO, K. TOKIWA, N. TERADA, M. TOKUMOTO, M. UMEDA ..	247

## 2.7 Theory

---

Superconductivity in Bad Metals V.J. EMERY, S.A. KIVELSON .....	253
--	-----

Josephson Effect in $d_{x^2-y^2}$ -Wave Superconductors Y. TANAKA, S. KASHIWAYA .....	259
Tunneling Spectroscopy of $d$ -Wave Superconductors S. KASHIWAYA, Y. TANAKA, M. KOYANAGI, K. KAJIMURA .....	263
Transverse Plasma Modes in a Tight-Binding Model of Layered Narrow-Band Anisotropic Superconductors S. MISAWA .....	267
Monte Carlo Estimate of Intrinsic Critical Current for 3D Josephson-Junction Array Model C. KAWABATA, M. TAKEUCHI, S.R. SHENOY, A.R. BISHOP .....	271

### 3 Chemistry

---

#### 3.1 Homologous Layered Compounds

---

Chemical Stabilization and Flux Pinning in Hg-Based Superconductors K. KISHIO, J. SHIMOYAMA, K. YAMAURA, Z. HIROI, M. TAKANO, O. CHMAISSEM, J.D. JORGENSEN .....	279
A New Method of Describing Crystal Structures for High- $T_c$ Superconductors and Related Compounds N.R. KHASANOVA, F. IZUMI .....	285
Preparation and Thermal Stability of $(\text{Cu},\text{M})\text{Ba}_2\text{Ca}_3\text{Cu}_4\text{O}_y$ ( $\text{M} = \text{CO}_3$ , $\text{SO}_4$ , $\text{NO}_3$ ) A. IYO, K. TOKIWA, N. TERADA, M. TOKUMOTO, M. HIRABAYASHI, H. IHARA .....	289
Synthesis of High-Pressure Cu System Superconductors by Sol-Gel Method Y. MASUDA, J.S. JIN, X.J. WU, K. NAKANISHI, K. TANABE .....	293
Preparation of $\text{CuBa}_2\text{Ca}_3\text{Cu}_4\text{O}_{12-y}$ Single Crystals Under High-Pressure K. TOKIWA, A. IYO, T. TSUKAMOTO, J. AKIMOTO, Y. OOSAWA, H. IHARA .....	297
Structural Characterization of Nonstoichiometry in $\text{Cu}_x\text{Ba}_2\text{Ca}_3\text{Cu}_4\text{O}_y$ Superconductor J. AKIMOTO, H. HAYAKAWA, Y. GOTOH, Y. OOSAWA, K. TOKIWA, A. IYO, H. IHARA .....	301
Preparation and Properties of $\text{CuSr}_2(\text{Y}_x\text{Ca}_{1-x})\text{Cu}_2\text{O}_y$ and $\text{Cu}(\text{Sr}_z\text{Ca}_{1-z})_2\text{YCu}_2\text{O}_y$ J. JIN, Y. MASUDA, K. TANABE .....	305
Synthesis of Hg-1234 Oxide Superconductor Under Ambient Pressure R. USAMI, M. ITOH, S. ADACHI, A. YAMAMOTO, K. TANABE .....	309
Syntheses and Properties of $\text{HgBa}_2\text{CaCu}_2\text{O}_{6+\delta}$ with Various Oxygen Contents A. FUKUOKA, A. TOKIWA-YAMAMOTO, M. ITOH, R. USAMI, S. ADACHI, H. YAMAUCHI, K. TANABE .....	313

Pb-Based Cuprate Superconductor with the 1223 Structure T. TAMURA, S. ADACHI, X.J. WU, C.Q. JIN, T. TATSUKI, H. YAMAUCHI, N. KOSHIZUKA, K. TANABE .....	317
New Compounds in Pb-Ba(Sr)-Ca-Cu-O System A. TOKIWA-YAMAMOTO, X.J. WU, S. ADACHI, K. TANABE .....	321
Structural Characterization of the Superconducting $\text{GaSr}_2\text{Ca}_{n-1}\text{Cu}_n\text{O}_{2n+3}$ System J. RAMIREZ-CASTELLANOS, Y. MATSUI, E. TAKAYAMA-MUROMACHI, M. ISOBE .....	325
$\text{NdBa}_2\text{Cu}_3\text{O}_{7-\delta}$ Single Crystal Growth by the Traveling-Solvent Floating-Zone Method K. KURODA, I.H. CHOI, T. EGI, H. UNOKI, N. KOSHIZUKA .....	329
Growth of Large $\text{LaBa}_2\text{Cu}_3\text{O}_{7-y}$ and $\text{Bi}_2\text{Sr}_2\text{CaCu}_2\text{O}_{8-y}$ Crystals K. OKA, T. ITO .....	333
Low Temperature Growth of $\text{YBa}_2\text{Cu}_3\text{O}_{6+\delta}$ Single Crystals with Ba-Cu-O-F Flux Y. YAMADA, Y. NIITORI, I. HIRABAYASHI, S. TANAKA .....	337
Detwinning and Retwinning of $\text{YBa}_2\text{Cu}_3\text{O}_{7-\delta}$ Single Crystals with Variable Oxygen Stoichiometry A.I. RYKOV, W.J. JANG, H. UNOKI, S. TAJIMA .....	341

### 3.2 Oxygen and Carrier Doping

---

Structural Study on the Copper Oxyhalide Sr-Ca-Cu-O-Cl System X.J. WU, C.Q. JIN, T. TATSUKI, T. TAMURA, S. ADACHI, K. TANABE ....	347
A New Approach to Hole-Doping into Halo-Oxocuprates, — “ <i>Apical Oxygen Doping</i> ” — C.Q. JIN, X.J. WU, P. LAFFEZ, T. TATSUKI, T. TAMURA, S. ADACHI, H. YAMAUCHI, N. KOSHIZUKA, K. TANABE .....	351
High Pressure Synthesis of $(\text{Ca,K})_2\text{CuO}_2\text{Cl}_2$ Superconductor T. TATSUKI, S. ADACHI, M. ITOH, T. TAMURA, X.J. WU, C.Q. JIN, N. KOSHIZUKA, K. TANABE .....	355
Coulometric Determination of Pr in the Ln-Ba-Cu-O System M. KATO, Y. MASUI, K. SEIMARU, K. YOSHIMURA, K. KOSUGE .....	359
Normal State Resistivity of $\text{La}_{2-x}\text{Ba}_x\text{CuO}_{4-\delta}$ Single Crystals M.K.R. KHAN, H. TANABE, I. TANAKA, H. KOJIMA .....	363
The Change of Electron Density from $\text{YBa}_2\text{Cu}_3\text{O}_6$ to Twin-Free $\text{YBa}_2\text{Cu}_3\text{O}_{6.9}$ Single Crystals W.J. JANG, H. MORI, M. WATAHIKI, S. TAJIMA, N. KOSHIZUKA .....	367
Superconductivity in Th-Contained Bi-2222 Compounds K. YOSHIDA, H. SASAKURA, K. YOSHIARA, Y. HAYASHI .....	371
Magnetic Properties of Tm-Cu-O System Prepared Using a High-Pressure Technique T. TATSUKI, S. ADACHI, M. ITOH, T. TAMURA, X.J. WU, C.Q. JIN, H. YAMAUCHI, N. KOSHIZUKA, K. TANABE .....	375

Synthesis and Magnetic Properties of Rare-Earth Cuprates $R_2Cu_2O_5$ ( $R = Y, Tb, Dy, Ho, Er, Tm, Yb$ and $Lu$ ) K. ISAWA, Y. YAEGASHI, M. KOMATSU, M. NAGANO, Y. WAKIYA . . . . .	379
--	-----

### 3.3 Phase Diagrams and Processing

---

Phase Relationships and Cation Disorder in $RE_{1+x}Ba_{2-x}Cu_3O_{7+\delta}$ , $RE = Pr, Nd, Sm, Gd$ M.J. KRAMER, H. WU, K.W. DENNIS, B.I. POLZIN, D.K. FALZGRAF, R.W. MCCALLUM . . . . .	385
Relation Between Silver and Residual Carbon Content in the Processing of $Tl_{0.5}Pb_{0.5}Sr_2CaCu_2O_{7-\delta}$ C. PARK, D.H. LEE, R.A. CONDRADE, R.L. SNYDER . . . . .	391
Effect of Ag Addition on Phase Transformation in YBCO System W. SHIMIZU, S. NAGAYA, S. IWATA, Y. SASAKI . . . . .	397
Influence of an Atmosphere on the Structural Change in $YBa_2Cu_3O_x$ by Heat-Treatment S. EDO, T. TAKAMA . . . . .	401
Reactive Sintering for Oriented and Connected Bi-2223 Superconductive Oxide from a Mixture of Delaminated Bi-2212 and Fine Powdered Supplemental Ingredients T. KASHIMURA, T. ISOBE, M. SENNA, M. ITOH, T. KOIZUMI . . . . .	405
Synthesis and Properties of Fe-Doped (Bi,Pb)2223 by Co-Precipitation Method T. SAKURAI, K. TANAKA, N. KOMADA . . . . .	409
Desorption Behaviors of $H_2O$ , $CO_2$ and $O_2$ in Bi-Based Superconductors by Thermal Desorption Spectroscopy K. TOBIISHI, T. KIKUCHI, K. FURUYA, A. MURATA, M. SATOH, S. YOSHIZAWA . . . . .	413

### 3.4 Non-cuprate Materials

---

Preparation and Superconductivity of New Silicon Clathrate Compounds S. YAMANAKA, H. KAWAJI, M. ISHIKAWA . . . . .	419
Systematic Studies on Phase Stability and Superconductivity in $REM_2B_2C$ ( $RE =$ Rare Earths, $M = Pd$ and $Pt$ ) H. FUJII, T. KIMURA, K. HIRATA, H. KUMAKURA, K. TOGANO . . . . .	425
Characterization of $Ba_{1-x}K_xBiO_{3-y}$ Synthesized by an Electrochemical Method with the Influences of Heat Treatment H. MINAMI, T. UZUMAKI, H. UWE . . . . .	429
A New Sulfide $SrV_2S_5$ : Synthesis, Structural, Electrical and Magnetic Studies N. KIJIMA, I. SHIMONO, S. IKEDA, T. MATSUMOTO, S. NAGATA . . . . .	433
A New Organic Superconductor: $(DTEDT)[Au(CN)_2]_{0.4}$ H. MORI, Y. MISAKI, N. HIGUCHI, H. FUJIWARA, T. YAMABE, T. MORI . . .	437

## 4 Flux Pinning

---

### 4.1 Flux Observation

---

Magneto-Optical Imaging of Transport Current Densities in Superconductors G.W. CRABTREE, U. WELP, D.O. GUNTER, W. ZHONG, U. BALACHANDRAN, P. HALDAR, R.S. SOKOLOWSKI, V.K. VLASKO-VLASOV, V.I. NIKITENKO .....	445
Flux Density Distribution on YBCO by Micro Hall Probe H. FUJIMOTO, T. BAN, K. KAWANO, K. OHNO .....	451
Bitter Decoration Technique of YBaCuO Superconducting Thin Film Y. HIGASHIDA, Y. SUGAWARA, K. MICHISHITA, Y. IKUHARA, Y. KUBO, K. SASAKI, H. SAKA, N. UNO .....	455
Direct Observation of Electromagnetic Microfields by Interference of Three Electron Waves T. HIRAYAMA .....	459

### 4.2 Flux Pinning and Flux Dynamics

---

High Critical-Current Density of Nd(Ba,Nd) <sub>2</sub> Cu <sub>3</sub> O <sub>7-δ</sub> Single Crystals T. EGI, J.G. WEN, W. TING, T. HIGUCHI, S.I. YOO, K. KURODA, H. UNOKI, M. MURAKAMI, N. KOSHIZUKA .....	465
The Relationship Between Pin Distribution and Scaling Behavior in High T <sub>c</sub> Superconductor T. KISS, T. NAKAMURA, F. IRIE, M. TAKEO, K. YAMAFUJI .....	469
The Physics of Superconducting Levitation B. LEHNDORFF, H.G. KÜRSCHNER, B. LÜCKE, A.M. PORTIS .....	473
Dimensionality Transition of the Vortex State in Bi <sub>2</sub> Sr <sub>2</sub> CaCu <sub>2</sub> O <sub>8+δ</sub> D.M. POOKE, C. BERNHARD, Y. KOTAKA, J.L. TALLON, J. SHIMOYAMA, K. KISHIO, C. NIEDERMAYER .....	477
Experimental Evidence of A New Magnetic Flux Pinning Center in Nd <sub>1</sub> Ba <sub>2</sub> Cu <sub>3</sub> O <sub>y</sub> Single Crystals Prepared Under a Reduced Oxygen Partial Pressure W. TING, T. EGI, R. ITTI, K. KURODA, N. KOSHIZUKA .....	481
Effect of Heavy Ion Irradiation on the Magnetization of La214 Single Crystals N. CHIKUMOTO, M. KONCZYKOWSKI, K. KISHIO, T. KIMURA, T. TERAJ .....	485
Microgravity Effect for Melting and Solidification of YBa <sub>2</sub> Cu <sub>3</sub> O <sub>7-y</sub> K. WAZUMI, J. SHINOHARA, T. FUJII, Y. IMAGAWA, Y. SHIOHARA .....	489
Vortex Motion by the Thermal Force in YBa <sub>2</sub> Cu <sub>3</sub> O <sub>7-δ</sub> T. SASAKI, J. IKEDA, K. YAMADA, T. NAITO, K. WATANABE, N. KOBAYASHI .....	493
Flux Pinning Characteristics in YBa <sub>2</sub> Cu <sub>3</sub> O <sub>7</sub> with Columnar Defects M. KIUCHI, T. MATSUSHITA .....	497



Heat-Treatment Dependence of $Y_2BaCuO_5$ Growth in $Y_{1+2n}Ba_{2+n}Cu_{3+n}O_y$ ( $0.1 \leq n \leq 0.4$ ) K. SUGAWARA, K. YAMAMOTO, S. KAWASHIMA, Y. KIKUCHI, Y. NAKAMURA, H. HIROSE .....	501
Effect of Fe Substitution on Superconductivity and Flux Pinning of Bi-2212 Single Crystal G.D. GU, N. KOSHIZUKA .....	505
High Energy Proton Irradiation Induced Pinning Centers in Bi-2212 and Bi-2223 Superconductors J.O. WILLIS, H. SAFAR, J.H. CHO, J.Y. COULTER, M.P. MALEY, P.A. SMITH, D.S. PHILLIPS, J.L. ULLMANN, RILEY, G.N., JR., M.W. RUPICH, S. FLESHLER .....	509
Effect of 520MeV $Kr^{20+}$ Ion Irradiation on the Critical Current Density of Bi-2212 Single Crystals Y. ITO, T. TERAI, S. TANAKA, N. CHIKUMOTO, K. KISHIO .....	513
Qualitative Determination of Relationship Between Flux Pinning Effect and Irradiation Defects in Bi-2212 Single Crystal Y. SASAKI, W.L. ZHOU, Y. IKUHARA .....	517
Vortex-Glass State in BSCCO Single Crystals with $CuO_2$ Trilayers S.H. HAN, Y. ZHAO, G.D. GU, G.J. RUSSELL, N. KOSHIZUKA .....	521
Recovery of Superconducting State After Light Pulse Irradiation in Oxide Superconductor S. MARUMOTO, N. OHYA, N. SHIMIZU .....	525
Pinning Potential of Superconductors Estimated from High-Temperature Magnetization N. SAKAMOTO, T. AKUNE, K. EHARA, Y. IDE, T. MATSUSHITA .....	529
Sharp Variation in Resistivity of Weakly Pinned Superconductor at Transition Under Magnetic Field T. HAMADA, M. KIUCHI, E.S. OTABE, T. MATSUSHITA .....	533
Structures of Superconducting Order Parameter and Magnetic Flux Density in a Flux Line M. NOZUE, K. NODA, T. MATSUSHITA .....	537
The Vortex-Glass Transition in Low-Temperature Superconductors S. OKUMA, H. HIRAI .....	541

#### **4.3 Electromagnetic Properties**

---

Microwave Surface Resistance in the Vortex State of High- $T_c$ Superconductors Y. MATSUDA, M. GAIFULLIN, M. SAKAMOTO, K. KUMAGAI, K. KADOWAKI, T. MOCHIKU .....	547
ac Susceptibility of Pinned Vortices in $YBa_2Cu_3O_7$ Crystals with Correlated Disorder L. CIVALE, G. PASQUINI, P. LEVY, G. NIEVA, H. LANZA .....	553

Phase Transition on the Persistent Current Decay of $\text{Hi-T}_c$ Superconductor T. NEMOTO, S. NOZAKI, M. MASUDA . . . . .	559
Current-Voltage Characteristics of c-Axis Oriented Polycrystalline YBCO Films H. ISHII, S. HIRANO, N. YOSHIDA, K. FUJINO, K. SATO, T. HARA . . . . .	563
Neutron Irradiation Effect on the Secondary Peak Observed in the Magnetization Curves of $\text{La}_{214}$ Single Crystals N. CHIKUMOTO, K. KISHIO, T. KIMURA, T. TERAII . . . . .	567
Kim Critical State in Twinned $\text{YBa}_2\text{Cu}_3\text{O}_7$ Single Crystal T. MIKAYAMA, T. ISHIDA, K. OKUDA, H. ASAOKA, Y. KAZUMATA, K. NODA, H. TAKEI . . . . .	571
Magnetic Properties of Y-123 Superconductors Grown by MPMG and SRL-CP Method Under Various Annealing Processes M. WATAHIKI, W. JANG, N. SAKAI, M. MURAKAMI . . . . .	575
Quantitative ESR Measurements of $\text{Y}_2\text{BaCuO}_5$ Dispersed in MPMG Y-Ba-Cu-O Superconductor K. SUGAWARA, Y. KIKUCHI, K. YAMAMOTO, S. KAWASHIMA, Y. NAKAMURA, H. HIROSE . . . . .	579
Peak Effect in Iodine-Intercalated $\text{Bi}_2\text{Sr}_2\text{CaCu}_2\text{O}_{8+y}$ Single Crystals S. OOI, T. TAMEGAI, T. SHIBAUCHI . . . . .	583
Vortex Lattice Melting and Peak Effect in $\text{Bi}_2\text{Sr}_2\text{CaCu}_2\text{O}_{8+y}$ T. TAMEGAI, S. OOI, T. SHIBAUCHI . . . . .	587
Vortex Dynamics and Frequency-Dependent ESR Anomalies in $\text{Tl}_2\text{Ba}_2\text{Ca}_2\text{Cu}_3\text{O}_{10}$ A. NISHIDA, C. TAKA, K. HORAI . . . . .	591
Anomalies of The c-Axis Resistivity in Single Crystalline $\text{Bi}_2\text{Sr}_2\text{CaCu}_2\text{O}_{8+\delta}$ K. KADOWAKI, T. MOCHIKU . . . . .	595
Magnetic Torque of ZnPc-Intercalated $\text{Bi}_{2212}$ Single Crystal K. INOUE, S. KAWAMATA, K. OKUDA, L. GRIGORYAN . . . . .	599
Magnetic Torque of Oriented Bulk Bi-Sr-Ca-Cu-O by Shock-Loading Method S. KAWAMATA, K. OKUDA, M. KIKUCHI, H. HIKOSAKA, Y. SYONO . . . . .	603
Magnetic Torque of Oxygen Controlled $\text{Bi}_2\text{Sr}_2\text{CaCu}_2\text{O}_{8+\delta}$ Single Crystal K. INOUE, S. KAWAMATA, K. OKUDA . . . . .	607
Power Spectrum of Voltage Noise and Vortex State of $\text{Bi}_2\text{Sr}_2\text{CaCu}_2\text{O}_{8+x}$ Single Crystals Y. ZHAO, G.D. GU, S.H. HAN, G.J. RUSSELL, N. KOSHIZUKA . . . . .	611
Scaling of Current-Voltage Characteristics in Superconducting Bi-2223 Tape Wires M. KIUCHI, K. NOGUCHI, T. MATSUSHITA, T. KATO, T. HIKATA, K. SATO . . . . .	615
Peak Effect in Single Crystalline $\text{YNi}_2\text{B}_2\text{C}$ K. HIRATA, H. TAKEYA, T. MOCHIKU, K. KADOWAKI . . . . .	619

3rd Harmonic ac Susceptibility in Oxide Superconductors E.S. OTABE, T. MATSUSHITA .....	623
Proximity Effected Magnetization of NbTi Multifilamentary Wires in Parallel Magnetic Field T. AKUNE, S. MIYAMOTO, K. MIZUSAKI, N. SAKAMOTO, O. MIURA .....	627
Experimental Examination on <i>E-J</i> Characteristics in Superconducting PbBi Alloys B. NI, T. WAKUDA, K. FUNAKI, E.S. OTABE, T. MATSUSHITA .....	631
<i>E-J</i> Characteristics in a Hollow Cylinder of Bi(2212) T. WAKUDA, T. SHIGEMITSU, K. FUNAKI, M. TAKEO, K. YAMAFUJI, J. SHIMOYAMA, K. KISHIO .....	635
Nonlinear <i>I-V</i> Characteristics of YBa <sub>2</sub> Cu <sub>3</sub> O <sub>x</sub> Thin Films in High Magnetic Fields K. NAKAO, K. HAYASHI, Y. ENOMOTO, N. KOSHIZUKA .....	639
<b>Author Index</b> .....	I-1
<b>Key Word Index</b> .....	I-7

## Contents of Volume 2

### 5 Wires, Tapes, and Bulk

- 5.1 YBCO Type Superconductors
- 5.2 BSCCO, TBCCO, and Other Type Superconductors
- 5.3 Applications

### 6 Thin Films

- 6.1 Growth Mechanism and Preparation Technologies
- 6.2 Epitaxial Growth of Related Materials and Others

### 7 Device Applications

- 7.1 Josephson Junctions
- 7.2 SQUID
- 7.3 Microwave Devices
- 7.4 Other Superconducting Devices

### 8 System Applications

- 8.1 Electric Power Systems and Large-Scale Systems
- 8.2 Magnetic Shielding and Magnetic Bearing
- 8.3 Other Applications

**Author Index**

**Key Word Index**