SCIENTIFIC PUBLICATIONS PROLIFERATE
In the summer issue of the Ferroelectricity Newsletter we highlighted this year's International Symposium on Integrated Ferroelectrics. The main part of this issue is devoted to listing the oral and poster presentations at the 12th IEEE International Symposium on the Applications of Ferroelectrics held 31 July to 2 August 2000 in Honolulu Hawaii.

ISAF 2000 General Chairs Angus I. Kingon and Dwight Viehland noted in their message that “the 409 contributions accepted for presentation in the meeting cover a large number of complementary topics, reflecting the breadth and depth of current activities in this interdisciplinary field.”

Ferroelectricity is indeed an interdisciplinary field, a fact that is reflected in the scope of new publications. On pages 19 through 21 we will introduce you to a sample of these new publications.

The reports of Technical Insights, for instance, are extensive studies of key industries and technologies dealing with advanced ceramics, engineering polymers, nanophase materials, electronic materials, optical coatings, and quasicrystals. Each report, written by top technology analysts, is a guide for critical business decisions. In addition to an analysis and forecast of the market, each one sets forth the industry leaders, key players, and their strategic research.

Focusing on highly adaptive polycrystalline ceramics and other materials used in thin/thick devices, Ferroelectric Devices by Kenji Uchino offers chapters on the mathematical treatment of ferroelectrics, high permittivity dielectrics, ferroelectric memory, pyroelectric, piezoelectric, and electrooptic devices, PTC materials, and the future of ferroelectric devices.

Since electroceramics are playing an increasingly important role in many key technologies including communications, energy, electronics, electronic packaging, and automation, the Journal of Electroceramics has expanded its publication to six issues in 2000.

The fastest growing areas of solid state technology are presently dominated by thin-film devices and circuit assemblies. In five topical volumes, the Handbook of Thin Film Devices deals with the frontiers of research, technology, and applications.

We will continue to keep you abreast of any new developments in the field of ferroelectricity.

Rudolf Panholzer
Editor-in-Chief
ISAF 2000 PAPERS

12TH IEEE INTERNATIONAL SYMPOSIUM ON THE APPLICATION OF FERROELECTRICS

The following is a list of titles and authors of oral and poster contributions given at ISAF, held 31 July - 2 August 2000 in Honolulu, Hawaii.

CHARACTERIZATION

Chemical-solution processing and patterning of integrated ferroelectrics
D. Payne
Nonlinear behavior in piezoelectric ceramic transducers
S. Takahashi
The renaissance of diffraction methods: Electroactive materials studies
S. Misture
Measuring fracture toughness of PZT
T. Karastamatis and C.S. Lynch
Vibration amplitude distribution measurements on piezoelectric PZT/glass composite transducers for ultrasonic bio-cell filters
E. Benes, A. Frank, H. Böhm, M. Gröschl, F. Templer, and H. Novotny
Influence of electric field on R-curve behavior in BaTiO₃ and PZT
R. Niefanger, A. Kolleck, and G.A. Schneider
Time-resolved synchrotron X-ray scattering studies of ferroelectric thin films
Local atomic structure and large piezoelectric response
T. Egami
Scanning nonlinear dielectric microscopy with nanometer resolution
Y. Cho, S. Kazuta, and K. Matsuura
Phases in relaxor ferroelectric crystals
C.-S. Tu, V.H. Schmidt, L.-F. Chen, and B.-C. Cheng
Dielectric losses in ferroelectric thin films by reversible domain wall motion
R. Waser

PIEZOELECTRICS AND ELECTROstrictors

Cymbal transducer: A review
R. Newnham
A piezomotor for the small actuator market
L. Petit, P. Gonnard, and G. Gréhant
In-plant polarization for high sensitivity ferroelectric MEMS ultrason transducers
J.J. Bernstein, J. Bottari, K. Houston, G. Kirkos, and R. Miller
Electrical biasing of PZT ceramic material
P. Bednarchik, and J. Hughes
Effects of substitution on electrical properties of (Bi₁ₓNa₁₂₋ₓ)TiO₃-based lead-free ferroelectrics
T. Takenaka
The variation of piezoelectric and electrostrictive strain as a function of frequency and applied electric field using an interferometric technique
W. Ren, A. Masys, G. Yang, and B. Mukherjee
Loss mechanisms in piezoelectrics
K. Uchino, J. Zheng, and Y.-H. Chen
Piezoelectric properties of PZT thick films on Si prepared by an interfacial polymerization method
T. Tsurumi, S. Ozawa, S. Wada, and M. Yamane
MEMS accelerometer using PZT films
Trapped-energy vibratory gyroscopes using a partially polarized piezoelectric ceramic plate with plano-mesa structure
H. Abe, T. Yoshida, T. Ishikawa, N. Miyazaki, and H. Watanabe
Cylindrically shaped “W” membrane hydrophone
B. Jiao
Electrostrictive effect and load capability in electron irradiated P(VDF-TrFE) copolymer
Z.-Y. Cheng, T.B. Xu, V. Bharti, S.J. Gross, T. Maai, Q.M. Zhang, T. Ramatowski, L. Ewart, and R. Ting
ISAF 2000 PAPERS

Electromechanical properties of piezoelectric spiral actuators
F. Mohammadi, B. Jadidian, A. Jain, A. Khokhin, S. Danforth, and A. Safari

The experimental SAW propagation characteristics of LiNbO₃NH₃ and LiTaO₃ with free and metallized surfaces
F. Hickernell

Crystal structure of the relaxor ferroelectric Pb₂ScTaO₆ in the paraelectric and ferroelectric states
K. Baba-Kishi and P. Woodward

Effect of microstructure on ferroelectric and piezoelectric behavior of PLZT systems
K. Ramam, D. Sastry, K. Trinath, N. Prasad, and A. Bhanumathi

Structure-property relations in sol-coated PMN ceramics: Microscopy, dielectric and electromechanical response
A. Sehirlioglu, C. Yoon, and S. Pilgrim

Piezoceramic thick films: Technology and applications state of the art in Europe
W. Wolny

Lead titanate ceramics for high frequency resonator
K. Hayashi, A. Ando, and Y. Sakabe

Multilayer bulk PZT actuators for flying height control in ruggedized hard disk drives
D.F.L. Jenkins, C. Chilumbu, G. Tunstall, W.W. Clegg, and P. Robinson

Piezoelectrically driven high-flow rate micro-pump

Internal fields in PT/P(VDF-TrFE) 0-3 composites
B. Ploss, B. Ploss, F.G. Shin, H.L.W. Chan, and C.L. Choy

From ferroelectric ceramics and single crystals to thick and thin films: How domain-wall processes control the piezoelectric properties
D. Damjanovic

DYNAMIC RANDOM ACCESS MEMORIES

Low temperature MOCVD of BST thin film for high density DRAMs
H. Cho, J. Park, Y. Yu, J. Roh, and C. Kim

MOCVD deposition of BST thin films for future DRAM applications
J. Lindner, M. Schumacher, F. Schienle, D. Burgess, P. Strzyzewski, and H. Juergensen

Capacitance and admittance spectroscopy analysis of hydrogen-degraded Ba₀.₅Sr₀.₅TiO₃ thin films
R. Liedtke and R. Waser

Investigation of failure modes under AC and DC stress and implications for device reliability in LS-MOCVD (Ba,Sr)TiO₃ thin films
C. Parker, S.-J. Kim, and A. Kingon

Narrow resonance profiling study of the oxidation of TiAlN and TaSiN barrier layers
F. Letendu, M. Hugon, J. Desvignes, B. Agius, L. Vickridge, and A. Kingon

The effects of the composition on the step coverage of SrTiO₃ thin films
S. Park, J. Choi, and K. Ko

PROCESSING

Processing-microstructure-property relationships of CSD and MOCVD derived oxide thin films
S. Hoffmann

On the microwave sintering technology for improving the properties of electronic ceramics
I.-N. Lin, K.-S. Liu, and H.-F. Cheng

Ferroelectric property improvement of Pb(Zr,Ti)O₃ films prepared by source gas pulsed-introduced MOCVD
H. Funakubo and K. Nagashima

Applications to photoconductor-ferroelectric memory of PZT thin films
M. Adachi, W. Wang, and T. Karaki

Hydrothermal synthesis of BaSrTiO₃ for applications in phased array antennas
B. Gersten and J. Synowczynski

Piezoelectric properties of perovskite-type BNKT ceramics textured by RTGG method
T. Tani, T. Takeuchi, E. Fukuchi, and T. Kimura

Fabrication and multilayer devices with ultrathin layers using electrophoretic deposition
J. Van Tassel and C.A. Randall

Direct write fabrication of
ISAF 2000 PAPERS

**DIFFRACTION**

R. Guo, Y. Bing, and A. Bhalla

**MINIATURIZED DOMAIN ENGINEERED MULTILAYER ACTUATORS**

B. Tuttle, P. Yang, E. Venturini, S. Nicolaysen, W. Olson, and G. Samara

**EXPLORATION OF SINGLE CRYSTAL ALKALINE BISMUTH TITANATE PIEZOELECTRICS**


**INTRINSIC STRUCTURAL MICROINHOMOGENEITY IN 0.92Pb(Zn_{1/3}Nb_{2/3})O_3-0.08PbTiO_3 CRYSTALS**

D. Viehland

**PIEZOELECTRIC MATERIALS IN THE 21ST CENTURY**

Y. (John) Yamashita

**THERMODYNAMIC BEHAVIOR, GROWTH, AND ANISOTROPIC PROPERTIES OF PIEZOCRYSTALS**

Z.-G. Ye and M. Dong

**GROWTH AND CHARACTERIZATION OF LARGE HIGH QUALITY Pb(Mg_{1/3}Nb_{2/3})_1-x Ti_x O_3 BY THE BRIDGMAN METHOD**

M.C.C. Custodio, Y.T. Fei, K. Zawilski, R. De Mattei, and R.S. Feigelson

**CHARACTERIZATION OF SINGLE CRYSTALS**

C.S. Lynch

**SINGLE CRYSTAL NAVAL TRANSDUCER DEVELOPMENT**

J.M. Powers, F. Nussbaum, and M.B. Moffett

**CAPACITORS**

Multilayer ceramic capacitors (MLCC) with base metal electrodes

**DEITLEV F.K. HENNINGS**

Piezoelectric materials in the 21st century

Y. (John) Yamashita

**AQUEOUS-BASED PROCESSING OF MULTILAYER CAPACITOR**

J. Adair

**SYNTHESIS AND CHARACTERIZATION OF TiO_2 FILMS FOR DEEP TRENCH CAPACITOR APPLICATIONS**

U. Schroeder, R. Jammy, J. Bruley, P. DeHaven, K. Wong, and J. Shepard, Jr.

**FULLY EMBEDDED FOIL-BASED (PbLa)ZrTiO_3 THIN FILMS WITH BASE METAL ELECTRODES**

J.-P. Maria, K. Cheek, S. Streiffer, and A. Kingon

**CHARGE COMPENSATION IN BARIUM TITANATE**

Y. Tsur and C. Randall

**HIGHLY ACCELERATED LIFETIME TESTING (HALT) OF LEAD ZIRCONATE TITANATE (PZT) THIN FILMS**

R.G. Polcawich, C.-N. Feng, P. Vanatta, R. Pietkarz, S. Kurtz, and S. Trolier-McKinstry

**DEVELOPMENT OF ECD Pt FILM AS A BST CAPACITOR ELECTRODE**


**PHYSICAL PROPERTIES OF (Ba,Sr)TiO_3 THIN FILMS USED FOR INTEGRATED CAPACITORS IN MICROWAVE APPLICATIONS**

F. Ayguavives, J.-P. Maria, A.I.
**ISAF 2000 PAPERS**

**Multilayer ceramic capacitors with base metal electrodes**

*Kingon, A. Tombak, A. Mortazawi, C. Ragaglie, G.T. Stauf, and J.F. Roeder*

**MODELING AND THEORY**

Ferroelectric transitions in imperfect crystals

*C.-C. Su, S. Semenovskaya, B. Vugmeister, and A. Khachatryan*

Phenomenological treatment of lead zinc niobate-lead titanate near the morphotropic phase boundary: Electric field and temperature dependence  

*P. Hana, L.E. Cross, K. Uchino, and S.-E. Park*

Thermodynamics versus kinetics of perovskites: Defect chemistry in the transition state  

*R. Meyer, R. Waser, J. Helmbold, and G. Borchardt*

Modeling the role of oxygen vacancies in thin film ferroelectric memory  

*V. Lo and Z. Chen*

**NONVOLATILE MEMORIES**

Preparation and evaluation of SrBi₂Ta₂O₉ thin films prepared by originally developed sol-gel method  

*I. Koiwa*

Ferroelectric properties of SrₓBi₂₋ₓTa₂O₉ dense ceramics  

*Y. Noguchi, M. Miyayama, and T. Kudo*

Retention and imprint properties in single-crystalline PLZT thin film capacitors  

*M. Kurasama, K. Kurihara, S. Otani, and M. Kutami*

AFM polarization studies in high-fatigue-endurance PZT thin film capacitors with Pt/RuO₂ top electrodes  

*E. Colla, I. Stolichnov, A. Tagantsev, and N. Setter*

Microstructure-property relations of ferroelectric bismuth-layered perovskite thin films  

*D. Hesse, A. Pignolet, C. Harnagea, N. Zakharov, H. Lee, and S. Senz*

A new ferroelectric material for use in FRAM: Lanthanum-substituted bismuth titanate  

*T. Noh, B. Park, B. Kang, S. Bu, and J. Lee*

Na₀.₅K₀.₅NbO₃ films for memory and microwave applications  

*A. Grishin*

Fatigue studies in Pb(Zn₁/₃Nb₂/₃)O₃-PbTiO₃ single crystals  

*M. Ozgul, K. Takemura, S. Trollier-McKinstry, and C. Randall*

Preparation and properties of soft ferroelectric BaTiO₃ thin films by sol-gel process  

*K. Nagata, J. Thongrueng, K. Nishio, Y. Watanabe, and T. Tsuchiya*

Damascene processing of ferroelectric capacitors  

*M. Russell, D. Vestyck, S. Bilodeau, L. Nguyen, and P.C. Van Buskirk*

High density embedded ferroelectric memory  

*S.R. Summerfelt, T.S. Moise, T. Sakoda, S.R. Gilbert, and J. Amano*

**TUNABLE AND RF MATERIALS**

On TCF in microwave dielectrics  

*I.M. Reaney, R. Ubc, D. Iddles, D. Cannell, and T. Price*

Extrinsic loss mechanisms in of BST ceramics in the X-band for tunable RF/MW passive components  

*K. Akdogan and A. Safari*

Microwave integrated circuits using thin film BST  


Electrically tunable microwave devices prepared by RF-magnetron sputtering  

*B.J. Gibbons, A.T. Findikoglu, D.W. Reagor, and Q.X. Jia*

Ferroelectric thin films on ferrites for tunable microwave applications  

*J.M. Pond, S.W. Kirchoefer, H.S. Newman, W.J. Kim, W. Chang, and J.S. Horwitz*

**OPTICS AND DISPLAYS**

Characterization of optical use LiNbO₃ and LiTaO₃ crystals by line-focus-beam acoustic microscopy  

*K. Kushibiki*

Fast switchable devices based on ferroelectric liquid crystals  

*W. Haase and F. Podgornov*

Domain nanotechnology in
ISAF 2000 PAPERS

LIQUID CRYSTALS

Ferroelectricity in SmC* phases


ISAF 2000 PAPERS

lithium niobate


Crucial effect of the coupling coefficients on quasi phase-matched harmonic generation in an optical superlattice

Y.-Y. Zhu, S.-N. Zhu, and N.B. Ming

Ferroelectric emission studies for a lithographic application

I.K. Yoo, S.O. Ryu, J.K. Lee, B.M. Kim, and J.W. Chung

PYROELECTRICS

Low cost multi-gas sensors based on uncooled pyroelectric detector arrays

R. Willing, P. Muralt, and N. Setter

Aerogel isolated pyroelectric IR detector

T. Evans, S. Sun, J. Ruffner, and P. Clem

Characterization of sol-gel derived (Pb,La)TiO3 pyroelectric thin film detectors

Y. Chen, C. Wang, Y. Huang, and M. Kao

ShSi films for IR imaging

S. Kotra and R.K. Pandey

POLYMERS

Design considerations for piezoelectric polymer ultrasound transducers

L. Brown

Electrostrictive and relaxor ferroelectric behavior of poly(vinylidene fluoride-trifluoroethylene) copolymer: A review


Ultrathin ferroelectric polymeric Langmuir-Blodgett films: Physical properties and structure

V. Fridkin, S. Ducharme, P. Dowben, L. Blinov, and S. Palto

PATTERNED STRUCTURES

Engineered ferroelectric superlattice: Materials and applications

Y.B. Chen, S.N. Zhu, Y.Q. Lu, and N.B. Ming

Piezoelectric microbeam biosensors

D. Polla, S. Mantell, J. Zhou, D. Markus, S. Zurn, Y. Nam, and G. Smith

New high performance monolithic bimorph piezoactuators

E.L. Colla, E. Thiele, and N. Setter

New type of piezoelectric trannsformer with very high power density

W. Wolny, T. Bove, K. Breboel, and E. Ringgaard

Design on Semiconductor coupled SAW convolver

K. Hohkawa, T. Suda, Y. Aoki, C. Hong, C. Kaneshiro, and K. Koh

FERROELECTRIC FIELD EFFECT TRANSISTORS

Current status of FET-type ferroelectric memories

H. Ishiibara

An analysis on retention characteristics in MF(M)IS structures for nonvolatile memory

M. Okuyama, H. Sugiyama, K. Kodama, T. Nakaiso, and M. Noda

The mechanism and integration processes of MFMOS one transistor memory devices

T. Li, B. Ulrich, H. Ying, F. Zhang, and S.T. Hsu

MFIS- and MFMIS-structures using (Sr,Ba)Ta2O9 films for ferroelectric-gate FET applications

E. Tokumitsu and S. Imafuku

POSTER PRESENTATIONS

PROCESSING

Fabrication and characterization of ferroelectric SBN doped silica-glass nanocomposites

S.G. Lu, C.L. Mak, and K.H. Wong

Development of highly textured piezoelectric ceramics via templated grain growth


Microstructure and polarization studies on modified SBNN


Development of tube actuators with helical electrodes using fused deposition of ceramics

M. Allahverdi, B. Jadidian, B. Harper, S. Rangarajan, and M. Jafari

Fabrication of bismuth titanate components with oriented micro-
structures via FDC and TGG
M. Allahverdi, B. Jadidian, Y. Ito, S.C. Danforth, and A. Safari

Particle-shape control of molten salt synthesized lead titanate
Y. Ito, B. Jadidian, M. Allahverdi, and A. Safari

In-situ formation of internal 3-D electrodes for piezoelectric fiber composite actuators
B.Z. Janos and N.W. Hagood

Progress in solid state conversion of high strain single crystal materials for navy applications
K. McNeal, D. Fiore, and R. Gentilman

Dielectric and electromechanical properties of (001)-textured PMN-PT
E. Sabolsky, S. Kwon, E. Suvaci, G.L. Messing, and S. Trolier-McKinstry

Densification and stress development in sol-gel derived PZT layers
R.J. Ong and D.A. Payne

Formation of lead titanate glass-ceramics from borate glasses
L.J. DeVore and J.E. Shelby

Processing and properties of textured (Na$_{0.5}$Bi$_{1.5}$)$_2$Ti$_3$O$_7$-BaTiO$_3$ ceramics
H. Yilmaz, G.L. Messing, and S. Trolier-McKinstry

Templated grain growth of tungsten bronze and perovskite ceramics
C. Duran, S. Trolier-McKinstry, and C.A. Randall

Nanometer size metal platelets

A new combinatorial process to fabricate PZT in self-assembly systems
G. He, T. Iijima, H. Funakubo, Z. Wang, and N. Sanada

Selective deposition of solution-derived ceramic thin layers onto nonplanar substrates
E.A. Mikalsen and D.A. Payne

Principle of surface relaxation on ZnO(0001) surface
H. Maki, N. Ichinose, N. Ohashi, H. Haneda, and J. Tanaka

Maximizing electromechanical properties of PMN materials for ultrasonic transducers
C.H. Yoon, A. Sehirlioglu, S.M. Pilgrim, and K. Bridger

Uniaxial stress dependence of the piezoelectric properties of lead zirconate titanate ceramics
G. Yang, S.-F. Liu, W. Ren, and B.K. Mukherjee

Phase coexistence and properties of Pb(Zr$_{1-x}$Ti$_x$)$_2$O$_3$-Sr(K$_{0.5}$ONb$_{0.75}$)$_2$O$_3$ (PZR/SKN) solid solutions

Highly C-axis oriented AlN films deposited on LiNbO$_3$ substrates for surface acoustic wave devices
C.-C. Cheng, K.-S. Kao, and Y.-C. Chen

Ferroelectric properties of thick Pb(Zr$_{1-x}$Ti$_x$)$_2$O$_3$ films prepared by pulsed laser deposition

Nonlinear dielectric behavior of piezoelectric ceramics
R. Pérez, J.E. García, and A. Albareda

Influence of B-site substitutions on dielectric and piezoelectric characteristics of fluoridated PZT

Optimization of new liquid-phase sintering aid for PZT
E. Ringgaard, W.W. Wolny, and E.R. Nielsen

Langasite and quartz monolithic filters
I. Mateescu, M. Hatzakis, E. Tsoi, and D. Tsoukalas

Langasite family piezoelectrics
Y.V. Pisarevsky and B.V. Mill

Investigation of piezoelectric properties in a new family of ferroelectric semiconductors Sn$_2$P$_2$S$_6$
V. Samulionis, J. Banys, Yu. Vysochanskii, and V. Cajipe

On the nature of a large piezoelectric anisotropy of heterogeneous ferroelectrics
V.Y. Topolov and A.V. Turik

Properties of samarium modified PZT
J.K. Juneja, C. Prakash, and T.P. Sharma
### ISAF 2000 PAPERS

**Polarization and piezoelectric studies on modified KNSBN**  

The property improvement by heat treatment of aerosol deposition method derived PZT thick film  
*Y. Akiyama, M. Lebedev, and J. Akedo*

Dynamics properties of PZT thick films structured on Si membrane by aerosol deposition method  
*M. Lebedev, J. Akedo, and Y. Akiyama*

Electromechanical properties of (Pb,La)TiO$_3$ thin films  
*H. Maiwa and N. Ichinose*

Effect of bipolar pulses on ferroelectric properties in lead zirconate titanate ceramics  
*T. Ogawa and K. Nakamura*

Growth of ZnO films on (012) LiTaO$_3$ by ECR-MBE and determination of their polarity  
*T. Shoji, K. Nakamura, and H.-B. Kang*

Texture engineering and enhanced piezoelectricity of Bi layer structured ferroelectric ceramics  
*T. Takeuchi, Y. Saito, and T. Tani*

Theoretical analysis of SAW propagation characteristic in strained media and applications for temperature stable coupling SAW composite substrates  
*K. Yamanouchi, K. Kotani, H. Odagawa, and Y. Chou*

A functionally graded piezoelectric material created by an internal temperature gradient  
*K. Yamada, D. Yamazaki, and K. Nakamura*

Synthesis of diol based Pb(Zr$_{0.52}$Ti$_{0.48}$)O$_3$ thin films from sol-gel method and their properties  
*J. Ahn, W. Lim, and J. Lee*

The effect of processing parameter on the piezoelectric coefficients of thin films  
*D.-G. Kim, K.-P. Choi, J.-D. Kim, and H.-G. Kim*

Preparation and piezoelectric properties of Pb(Zr,Ti)O$_3$ thick films on silicon  
*E. Thiele, D. Damjanovic, and N. Setter*

Electrostrictive and piezoelectric properties of Pb$\left[(\text{Mg}_{1/3}\text{Nb}_{2/3})_{1-x}\text{Ti}_x\right]$O$_3$ thin films  
*Z. Kighelman, D. Damjanovic, and N. Setter*

Piezoelectric relaxation in bismuth titanate based on ferroelectric ceramics  
*D. Damjanovic, P.D. Martin, C. Voisard, M.D. Maeder, and N. Setter*

Piezoelectric properties of tetragonal, morphotrophic, and rhomboedral Pb(Zr,Ti)O$_3$ thin films with (100), (111), and “random” texture  
*D.V. Taylor, D. Damjanivic, and N. Setter*

Fracture of piezoelectric ceramics under compression-compression loading  
*B.L. Cheng, M.J. Reece, F. Guiu, and M. Alguero*

Size effects in nanophase KPbTiO$_3$ and BaTiO$_3$  
*E.K. Akdogan and A. Safari*

Dielectric and piezoelectric properties of the Pb(InNb)$_3$ - PbZrO$_3$ solid solution system  
*E.F. Alberta and A. Bhalla*

New version of NIST database ‘ACMAT’ on ferro-piezoelectric and related materials  
*Y.E. Chernner and C.R. Sturrock*

Electromechanical properties of field-based (Ba,Sr)TiO$_3$  
*A. Amin and B.M. Kulwicki*

In-plane poless PZT films for MEMS applications  
*B. Xu, Y. Ye, L.E. Cross, R.G. Polcawich, S. Trolier-McKinstry, J.J. Bernstein, and R. Miller*

Piezoelectric properties of PNW-PMN-PZT ceramics for high power piezoelectric transformers  

Dielectric, piezoelectric and strain properties of PMW-PNN-PZT ceramics  

Dielectric properties of various Ba(Zr$_x$Ti$_{1-x}$)O$_3$ ceramics under DC bias  
*S. Wada, H. Adachi, H. Chazono, H. Kishi, and T. Tsurumi*

Ferroelectric films in a separation of ionic components of gases  
*M. Duta*

The affects of aging on PMN based
ISAF 2000 PAPERS

compositions
C.B. DiAntonio and S.M. Pilgrim

Effective compliance of 0.9PMN-0.1PT ceramics
S. Kurutcharry, M. Lejeune, M. Oudjedi

A new kind of process for preparing PZT thick films
A.I. Ding, X.Y. He, P.S. Qiu, and W.G. Luo

A new concept and first development results of a PZT thin film actuator

Observation of fine structures of nanodomains in donor-modified Pb(Zr,Ti)O₃ ferroelectrics
O. Tan and J.X. Li

Nonlinear third harmonic generation in piezoelectric ceramics: Direct and indirect contributions by intermodulation measurements
A. Albareda, J.H. Kayombo, and E. Minguella

Dielectric properties of (Sr,Pb)TeO₃ ferroelectric ceramics
C.I. Cheon and J.S. Kim

Electroceramic properties under high compressive stress and high electric fields
S.W. Mahon, A.R. Bowles, and D.A. Hall

SINGLE CRYSTALS

Improved growth and electrical properties of SrBi₂Ta₂O₉ single crystals
B. Sih, B.M. Dong, J. Tang, and Z.-G. Ye

Electromechanical properties of PMN-PT piezoelectric single crystals
K.C. Cheng, H.L.W. Chan, C.L. Choy, Q.R. Yin, H.S. Luo, and Z.W. Yin

Dielectric and piezoelectric properties of PMN-PT single crystals grown by the Bridgman method
P.-C. Wang, H.-S. Luo, X.-M. Pan, D.-L. Li, and Z.-W. Yin

Growth of PZN crystals with improved optical quality using the BSFT technique
S. Erdei, R.G. Schlecht, and L. Kovács

Growth and properties of La₀.₅Ga₀.₅Zr₁₋₀.₅O₁₄ single crystals
Y.V. Pisarevsky, P.A. Senyushchenkov, A.V. Belokopytov, and B.V. Mill

Fatigue and rejuvenation phenomena in ferroelectrics
V.Y. Shur, E.L. Rumyantsev, E.V. Nikolaeva, and I.S. Baturin

Domain kinetics in congruent and stoichiometric LiTaO₃
V.Y. Shur, E.L. Rumyantsev, E.V. Nikolaeva, E.I. Shishkin, and I.S. Baturin

Electric field induced preparation of domain pattern with charged domain walls in lithium niobate
V.Y. Shur, E.L. Rumyantsev, E.V. Nikolaeva, E.I. Shishkin, and A.V. Sokolov

Recent achievements in domain engineering: Periodic domain pattern in LiNbO₃ and LiTaO₃
V.Y. Shur, E.L. Rumyantsev, E.V. Nikolaeva, and E.I. Shishkin

Addition effect of Gd³⁺ on the ferroelectric transition and crystal growth of BNN

Growth of KₓLi₁₋ₓNb₅₋ₓO₁₅₊₂ₓ single-crystal fibers by the LHPG method and its characteristics
M. Matsukura, T. Karaki, and M. Adachi

Growth, thermal expansion, dielectric and ferroelectric characteristics of Sr-modified BaTiO₃ single crystals
D. Garcia, R. Guo, and A. Bhalla

Dependence of switching current on crystal orientation for (1-X) Pb(Zn₁/₃ Nb₂/₃ )O₃ - X PbTiO₃ single crystals
U. Belegundu, X.H. Du, and K. Uchino

Ferroelectric tungsten bronze lead barium niobate: Crystal structure and polarization mechanisms of the orthorhombic phase
R. Guo, H.T. Evans, Jr., and A. Bhalla

Elasto-optical and electro-optic studies of PZN-PT single crystals
Y. Lu, Y. Barad, Z.-Y. Cheng, S.-E. Park, and Q.M. Zhang

Liquid phase epitaxial growth of perovskite (Na,Bi)TiO₃ and its solid solutions on SrTiO₃(001) substrates
N. Ohashi, A.N. Soukhojak, G.W.
**ISAF 2000 PAPERS**

**Matsuzaki, A. Mineshige, and S. Fujii**

The effect of imprint on read and write operations in ferroelectric random access memories for lifetime prediction

**J.T. Rickes and R.M. Waser**

Switching in SrBi$_2$Ta$_2$O$_9$ ferroelectric thin films prepared by metallorganic decomposition

**X. Chen, F. Yan, C. Li, D. Wu, J. Zhu, and Y. Wang**

Preparation and characterization of SrBi$_2$Ta$_2$O$_9$ thin films on (100)-oriented LaNiO$_3$ electrodes

**J.B. Xu, G.D. Hu, I.H. Wilson, C.P. Li, and S.P. Wong**

The structural, dielectric and ferroelectric properties of La-modified bismuth titanate thin films prepared by sol-gel process

**Jianguo Zhu, C. Yu, D. Xiao, J. Zhu, and X. Yuan**

Fatigue in Pb(Mg$_{1/3}$Nb$_{2/3}$)$_{0.90}$Ti$_{0.10}$O$_3$ on TiN electrodes

**A. Fundora, O. Contreras, and J.M. Siqueiros**

The repeatable metallorganic chemical vapor deposition of ferroelectric thin films with highly uniform characteristics

**D. Burgess, F. Schienle, J. Lindner, M. Schumacher, and H. Juergensen**

Fabrication of Pb-based ferroelectric thin films by liquid delivery MOCVD

**M. Miyake, K. Lee, T. Nishida, S. Okamura, and T. Shiosaki**

Improvement in FRAM reliability

by suppression of double layer formation of PZT

**M. Shibata, S. Mihara, M. Shigeno, M. Tomotani, Y. Kotaka, and M. Nakamura**

Low temperature deposition of SBT thin films using modified sol-gel solutions

**N. Soyama, Y. Tokita, S. Mori, and K. Ogi**

Nanoscale retention behavior of preferentially oriented Pb(Zr,Ti)$_3$O$_3$ thin films

**W. Jo, J.W. Hong, M. Kim, and D.C. Kim**

Thermal stability of highly oxidation-resistant PZT/LSCO/Ir/TaSiN barrier layers for ferroelectric capacitor

**M.S. Kim, K.Y. Han, I.D. Kim, and H.G. Kim**

The reliable PZT thin film capacitors with IrO$_2$/Pt hybrid electrode on TiN/poly-Si for high density nonvolatile memory devices

**S.-H. Kim, D.-Y. Park, D.-S. Lee, H.-J. Woo, and J. Ha**

Hydrogen induced degradation phenomena of PZT ferroelectric capacitors

**J.-M. Koo, I. Bang, T.H. Kim, and J. Kim**

Fatigue and data retention characteristics of single-grained PZT thin films

**J.-S. Lee, C.-S. Kim, and S.-K. Joo**

The effect of IrO$_2$ thickness on ferroelectric properties of Pb(Zr,Ti)$_3$O$_3$ thin films with IrO$_2$/Pt hybrid electrodes

---

**Farry, S.A. Sheets, S.A. Sheets, and Y.-M. Chiang**

Nanodomain origin of unusually high field-induced strain in nonstoichiometric Na$_{1/2}$Bi$_{1/2}$TiO$_3$-BaTiO$_3$ single crystals

**A.N. Soukhojak and Y.-M. Chiang**

Cymbal drivers utilizing relaxor-based ferroelectric single crystal materials

**J.F. Tressler and T.R. Howarth**

The development of mesoscale accelerometers with single crystal piezoelectric materials

**P.A. Wlodkowski, K. Deng, and M.F. Kahn**

Growth and electromechanical properties of Ba(Ti$_{1-x}$Zr$_x$)O$_3$ single crystals

**Z. Yu, R. Guo, and A. Bhalla**

Crystallographically engineered non-lead perovskite, Ba(Zr$_{1-x}$Ti$_x$)O$_3$ for biomedical imaging transducers


Quasistatic linear and nonlinear dielectric response in ferroelectric relaxor systems

**Z. Kuntjak, V. Bobnar, C. Filipic, and A. Levstik**

PMN-PT detector for electron acoustics imaging system

**O.R. Yin, H.S. Luo, and G.R. Li**

**NONVOLATILE RANDOM ACCESS MEMORY**

Ferroelectric properties of Pt/SrRuO$_3$/PLZT/Pt capacitors


Improvement in FRAM reliability

---

**Nanoscale retention behavior of preferentially oriented Pb(Zr,Ti)$_3$O$_3$ thin films**

**W. Jo, J.W. Hong, M. Kim, and D.C. Kim**

Thermal stability of highly oxidation-resistant PZT/LSCO/Ir/TaSiN barrier layers for ferroelectric capacitor

**M.S. Kim, K.Y. Han, I.D. Kim, and H.G. Kim**

The reliable PZT thin film capacitors with IrO$_2$/Pt hybrid electrode on TiN/poly-Si for high density nonvolatile memory devices

**S.-H. Kim, D.-Y. Park, D.-S. Lee, H.-J. Woo, and J. Ha**

Hydrogen induced degradation phenomena of PZT ferroelectric capacitors

**J.-M. Koo, I. Bang, T.H. Kim, and J. Kim**

Fatigue and data retention characteristics of single-grained PZT thin films

**J.-S. Lee, C.-S. Kim, and S.-K. Joo**

The effect of IrO$_2$ thickness on ferroelectric properties of Pb(Zr$_{1-x}$Ti$_x$)O$_3$ thin films with IrO$_2$/Pt hybrid electrodes
ISAF 2000 PAPERS

Preparation of SrBi$_2$Ta$_2$O$_9$ thin films by MOCVD and their characterizations

S. Ando, M. Fukatsu, and T. Tsukamoto

Imprint in ferroelectric thin films: Trapped charges model

M. Grossmann, O. Lohse, D. Bolten, U. Boettger, and R. Waser

P-E hysteresis in SiBi$_2$LiTa$_2$O$_9$ ferroelectrics

C.I. Cheon, J.S. Kim, and J.H. Kim

Ferroelectric properties of an epitaxial PZT/Ir/ZrN/Si structure by sputtering

S. Horii, S. Yokoyama, and S. Horita

Preparation of PZT thin films for low voltage application by sol-gel method

N. Soyama, K. Maki, and K. Ogi

Physics based fatigue compact model for ferroelectric capacitors

E. Gondro, F. Schuler, O. Kowarik, and C. Kühn

Quantitative analysis of the bit size dependence on the pulse width and pulse voltage in atomic force microscope based memory device

J. Woo, S. Hong, and K. No

Observation of polarization reversal process in Pb(Zr,Ti)O$_3$ thin films using atomic force microscopy

H. Fujisawa, Y. Matsumoto, M. Shimizu, and H. Niu

FERROELECTRIC FIELD EFFECT TRANSISTORS

Effect of carrier concentration on the magnetic behavior of ferroelectric YMnO$_3$ ceramics and thin films

N. Fujimura, S. Yamamori, D. Ito, and T. Ito

High performance MFIS structure with silicon nitride buffer layer made by radical nitrogen source

Y. Fujisaki, S.K. Kang, and H. Ishiwaara

Fabrication of Bi$_2$SiO$_5$ thin films for MFIS structures

M. Yamaguchi, K. Hiraki, T. Homma, T. Nagatomo, and Y. Masuda

Electrical properties of Pt/SrBi$_2$Ta$_2$O$_9$/ZrO$_2$/Si ferroelectric gate structure


The structural and electrical properties of (Ba$_{0.5}$Sr$_{0.5}$)TiO$_3$ thin films grown on Si

S. Jun and J. Lee

Electrical characteristics of CeO$_2$ buffer layer for an FRAM

K. Kim, S. Kim, Y. Roh, H. Kee, and J. Yi

Effects of voltage distribution in Pt/SrBi$_2$Ta$_2$O$_9$/Ta$_2$O$_5$/Si structure on memory window of ferroelectric gate


Characteristics of thin film LiNbO$_3$ capacitors for a single transistor FRAM
### ISAF 2000 PAPERS

#### MODELING AND THEORY

**A correlation between bond valence and B-site ordering in perovskite lead-based compounds**
*C. Feng and C. Zhao*

**The effect of the segregation at the growth of relaxor ferroelectronic PMNT single crystals**
*H. Luo, H. Xu, S. Zhang, Y. Li, X. Fang, and Z. Yin*

**Computer modeling on KTN solid solutions**
*G. Borstel, R.I. Eglitis, and E.A. Kotomin*

**Modeling of the time dependent current in BST thin films in the short time range**
*R. Meyer, R. Liedtke, and R. Waser*

**Finite element simulation of multilayer structures and devices**
*K. Prume and R. Waser*

**Role of the soft dielectric energy in poling ceramics, glass-like systems and in domain average engineering**
*J. Erhard, M. Marvan, and J. Fousek*

**Eigenfrequencies variation definition method of ultrasonic oscillatory microwave systems with piezoelectrics**
*Arteym Gubenkov and Alexander Gubenkov*

**Modeling of a nonmonotonic behavior of effective properties in piezoelectric ceramics and composites**
*V.Y. Topolov, A.V. Turik, S.V. Glushanin, and G.S. Radchenko*

**Theoretical search of possible applications in RDP-ADP mixed crystals**
*E. Matsushita and N. Sakakibara*

**Numerical simulation of the space charge and Schottky barrier effects on ferroelectric thin films**
*V.C. Lo and Z.J. Chen*

**Investigation on dielectric, mechanical and piezoelectric nonlinearities in piezoceramics through a new equivalent circuit**
*P. Gonnard*

**A dynamic ferroelectric capacitance model for circuit simulators**
*C. Köhn, H. Königschmid, O. Kowarik, E. Gondro, and K. Hoffmann*

**Piezoelectric crystal transducers: Mathematical model**
*S.E. Moskowitz*

**Separation of nonlinear and friction-like contributions to the piezoelectric hysteresis**
*G. Robert, D. Damjanovic, and N. Setter*

**The simulation of switching in ferroelectric/ferroelastic polycrystals with a finite element model**
*S.C. Hwang*

**Finite element modeling of spiral actuators**
*A. Jain, F. Mohammadi, M.J. Matthewson, T.W. Chou, and A. Safari*

**Dielectric properties of SrTiO$_3$ based solid solution**
*V.V. Lemanov*
The FEM formulation for a 3D piezoelectric vibration under rotation and its application  
  *T. Tsuchiya, Y. Kagawa, and T. Miyahara*

The influence of the order clusters growth on the dielectric dispersion of ferroelectrics  
  *G.I. Ovtchinnikova and A.V. Saponova*

**PIEZOELECTRICS AND ELECTROSTRUCTORS: DEVICES**

Fabrication and evaluation of 1.3 PZT fiber/epoxy composites  
  *H.S. Lee, C. Richard, A. Agbossou, J. Pastor, and D. Guvonar*

High power piezoelectric transformer for driving a 28 W fluorescent lamp  

Development of a wide band transducer array for sonar applications  
  *V. Kurusingal, I. Bedwell, and G. Gatsios*

A low frequency transducer design with modified ring structure  
  *Y. Zhai, J. Lu, and B.L. Jiao*

1-3 piezoelectric composites tubular hydrophone  
  *D. Li and X. Song*

Linear inchworm piezoelectric actuator for MEDM  
  *S.M. Yuan, W.S. Zhao, and Z.L. Wang*

**ISAF 2000 PAPERS**

Mechanical stress and deflection of bending actuators based on functionally gradient materials  
  *A.Z. Kouvatov, T. Hauke, R. Steinhansen, W. Seifert, H.T. Langhammer, H. Beige, and H.P. Abicht*

Matching of series and parallel resonance frequencies for ultrasonic piezoelectric transducers  
  *I. Getman and S. Lopatin*

Bimorph piezoelectric sensor for photoacoustic microscope  
  *O. Vertsanova, Y. Yakimenko, and S. Selivanov*

Piezoelectric properties of KNbO₃ crystals for extensional modes  
  *K. Nakamura, T. Tokiwa, and Y. Kawamura*

Fabrication of piezoelectric microcantilever using PZT films for nanostorage  
  *J. Lee, J. Ahn, D. Kim, G. Young, Yeom, and T. Sands*

Efficiency optimization of multilayered piezoelectric resonators with respect to their application in bioseparation  
  *H. Böhm, F. Trampler, E. Benes, and M. Gröschl*

Efficiency of piezoelectrics with interdigitated electrodes  
  *A. Bowles, S. Mahon, F. Lowrie, and J. Fitzmaurice*

Measurement methods for direct piezoelectric coefficient  
  *M.G. Cain, M. Stewart, W. Battrick*

PZT thin film BI-layer devices for improved actuation in MEMS  
  *D.F.L. Jenkins, W.W. Clegg, E. Cattan, and D. Remiens*

Multilayer bulk PZT actuators for flying height control in ruggedized hard disk  
  *D.F.L. Jenkins, C. Chilumbu, G. Tunstall, W.W. Clegg, and P. Robinson*

Shape optimization of a flexextensional frame for use in an inchworm actuator  
  *A.D. Belegundu*

Ultrasound imaging multilayer transducer design  
  *AP.E. Bloomfield*

Production of an agile ultrasonic driver  
  *E. Kieronski and W. Schulze*

PZT piston driven hydraulic pumps  
  *L. Mauck and C.S. Lynch*

Stack actuator efficiency  
  *J. Menchaca, L. Mauck, and C.S. Lynch*

Arrays and piezocomposite transducers from hollow spheres  

Very high frequency focused transducers from hollow spheres  
  *S. Alkoy, R. Meyer, Jr., T. Ritter, J. Cochran, Jr., and R. Newnham*

Characterization of strained unimorph-type piezoelectric actuators  
  *J. Mulling, B. Dessent, P. Franzon, E. Grant, J. Palmer, D.
Rooker, T. Usher, and A. Kingon

Plate equations and equivalent circuit for piezoelectrically actuated flextensional transducers
  G. Percin and B.T. Khuri-Yakub

Finite element analysis of the effect of nonferroelectric second phases in Pb(Mg<sub>1/3</sub>Nb<sub>2/3</sub>)O<sub>3</sub>
  M. Koyuncu, W.B. Carlson, and S.M. Pilgrim

Fabrication of piezoelectric beam resonators

Recent advances in active fiber composites technology
  G.A. Rossetti, Jr., A. Pizzochero, and A.A. Bent

Photostrictive actuators – New perspective
  K. Uchino, P. Poosanaas, and K. Tonooka

Dielectric properties of PZT thick films on different substrates
  F. Tang and J.T. Wang

Hydrophones coupling piezoelectricity and tensegrity
  D.P. Williams and W.B. Carlson

Modeling of reticulated PZT/polymer composites
  D.P. Williams and W.A. Schulze

Stress analysis of Pu/PZT/Pt stack for MEMS application

Structural and dielectric properties of Sm substituted lead titanate
  C. Prakash and A. Bhalla

Piezoelectric properties of PZT thin film diaphragm structures
  D.J. Kim, J.-P. Maria, A.I. Kingon, S.-H. Kim, I.-S Chen, and J. Roeder

Active vibration damping using “low force”- “high displacement” piezoelectric actuators as stiffness tuner of elastic supports
  E.L. Colla, D. Daudet, J.P. Amann, J.M. Tellenbach, P.A. Müesli, and N. Setter

Low consumption damping of planar structures
  D. Guyomar, C. Richard, C. Gehin, and D. Audigier

PYROELECTRICS AND TEMPERATURE SENSORS

Properties of Mn doped PST:BST
  C. Prakash and A. Bhalla

Sol-gel derived pyroelectric barium strontium titanate thin films for infrared detector applications

Pyroelectric properties of PZT/P(VDF-TRFE) 0-3 composites
  W.Y. Ng, F.G. Shin, B. Ploss, H.L.W. Chan, and C.L. Choy

Calcium modified lead titanate thin films for pyroelectric applications
  C.M. Wang, Y.C. Chen, Y.T. Huang, and M.C. Kao

Thermally stimulated depolarization current in Sr<sub>0.255</sub>La<sub>0.005</sub>Ba<sub>0.7</sub>Nb<sub>2.9</sub>Ti<sub>4</sub> O<sub>6-y/2</sub> ceramic system
  H. Amorin, J. Portelles, F. Guerrero, M. Venet, and J.M. Siqueiros

Electrode enhanced pyroelectric domain reversals in ferroelectric crystals
  M. Unterberger, E. Born, E. Riha, and G. Kovacs

Ferroelectric characterization of meso-porous structures with polar- and optical-active clusters
  S.L. Bravina, N.V. Morozovsky, G.M. Tel’biz and A.V. Shvets

Temperature and humidity sensors with response to frequency conversion based on porous ceramics
  S.L. Bravina, N.V. Morozovsky, and E.G. Khainkina

Reconstruction of internal polarization distribution in DTGS crystals from unipolarity coefficient measurements
  O.V. Malyshkina

Silicone oxide film absorbing coatings for sensitive elements of ferroelectric detectors of radiation
  S.L. Bravina, N.V. Morozovsky, A.A. Strokach, K.V. Mikhailovskaya, P.E. Shepeliavyi, and I.Z. Indutniy

A chopperless-operated dielectric bolometer mode of infrared image sensor with ferroelectric BST film using improved operation
  M. Noda, Y. Hamakawa, H. Zhu, H. Xu, T. Mukaigawa, T. Nakamura, and M. Okuyama

Fabrication of NBPF for mid IR window of pyroelectric detectors
  K. Cho, K. Yang, and M. Lee
ISAF 2000 PAPERS

Transient noise of PZT-PSN pyroelectric detectors
  Y. Choi, S. Song, S. Bae, and M. Lee

Detectivities of thin-film NTC infrared sensors
  M. Yoo, D. Kim, S. Lee, and M. Lee

A PZT-based low-coercive ceramic material having ferroelectric and relaxor properties
  G.M. Akbaeva, A.V. Shilnikov, A.I. Burkhonov, and Y.N. Mamakov

POLYMERS

Electrostrictive response below 10 kHz and transition behavior of electron irradiated P(VDF-TrFE) copolymer
  X.-Z. Zhao, Y.W. Tang, W.M. Yue, and S.S. Guo

New ceramic polymer composites using high dielectric constant matrix
  Y. Bai, V. Bharti, Z.-Y. Cheng, H.S. Xu, and Q.M. Zhang

Dielectric relaxation and weak polarization response in relaxor ferroelectric P(VDF-TrFE) copolymer
  V. Bharti, Z.-Y. Cheng, and Q.M. Zhang

Electrostrictive effect and load capability in electron irradiation P(VDF-TrFE) copolymer
  Z.-Y. Cheng, T.B. Xu, V. Bharti, S.J. Gross, T. Mai, Q.M. Zhang, T. Ramatowski, L. Ewart, and R. Ting

Strategies for reducing mechanical brittleness in ferroelectric P(VDF-TrFE) copolymer films
  T. Ramatowski and G. Kavarnos

Novel polymeric elastomers for actuators
  J. Su, J.S. Harrison, and T. St. Clair

CAPACITORS AND DRAM

Properties of doped BaTi(Mn)O_3 + SiO_2 sintered in reducing atmospheres
  D.I. Spang, A. Safari, and I. Burn

Ba_{1-x}Sr_{x}TiO_3 (BST) thin film capacitors by metallorganicchemical vapor deposition (MOCVD)
  D.Y. Kaufman, P.K. Baumann, R.A. Erck, J. Im, S.K. Streiffer, and O. Auciello

Composite MLCC with X7R characteristics
  Zhilun Gui, Hong Cai, and Longtu Li

Study on structure and properties of X7R ceramics based on BaTiO_3 with high dielectric constants
  L. Li, R. Chen, and Z. Gui

Ferroelectric sodium-potassium-niobium silicate glass-ceramics
  D.E. Vernacotola, S. Chatlani, and J.E. Shelby

Doped alkaline earth titanates: From the defect chemistry of bulk ceramics to the conduction behavior of thin films
  C. Ohly, S. Hoffmann, K. Szot, and R. Waser

High energy density dielectrics for symmetric Blumleins
  W. Huebner and S.C. Zhang

Environmental impact of PZT bulk material
  T.R. Hellesoy, A.J. Jansen, J.A.M. Remmerswaal, and A. Stevels

Temperature and frequency dependence of the dielectric constant of relaxation ferroelectrics
  H.K. Guo and Y.N. Wang

Reversible and irreversible polarization processes in ferroelectric thin films
  D. Bolten, U. Boettger, M. Grossmann, O. Lohse, and R. Waser

Sputtered barium titane and barium strontium titanate films for capacitor applications in DC-DC converter
  B.-H. Tsao, S. Heidger, S. Fries Carr, and J.A. Weimer

Polar dielectric-dust and their incorporation into melt blown webs
  J. Nosek, L. Martinová, and A. Richter

Dielectric properties of Ba-Ti-O thin films prepared by MOCVD
  H. Masumoto, T. Tohma, T. Goto, Y. Masuda, and T. Hirai

Recrystallization of oxygen ion implanted Ba_{0.7}Sr_{0.3}TiO_3 thin films
  H. Liedtke, S. Hoffmann, and R. Waser

TUNABLE AND RF MATERIALS

Dielectric properties and crystal structure of Sr_{n+1}Ti_{n}O_{3n+1} films and SrTiO_3/BaTiO_3 superlattices grown by MBE
  J.H. Haeni, W. Tian, H. Chang, I.
ISAF 2000 PAPERS

Takeuchi, X.-D. Xiang, X.Q. Pan, and D.G. Schlom

Growth and characterization of high tunability Ba$_{0.5}$La$_{0.5}$TiO$_3$ thin films for microwave application

Low cost radio interrogation system for passive SAW sensors and transponders
C. Hausleitner, R. Steindl, A. Pohl, and F. Seifert

New concepts of wireless interrogable passive sensors using nonlinear components
C. Hausleitner, A. Pohl, M. Brandl, R. Steindl, and F. Seifert

Wireless magnetic fields sensor employing SAW-transponder
R. Steindl, C. Hausleitner, A. Pohl, H. Hauser, and F. Seifert

Dielectric characteristics of modified Ba$_{2-x}$Co$_x$Cu$_z$Zn$_{3-x}$Fe$_{23.5}$O$_{41}$ planar hexaferrite
H. Zhang, L. Li, J. Zhou, Z. You, and Z. Gu"i

Microwave frequency range ferroelectric PZT/silicon resonators directly written with a nanolithographic process
D. Hauden, S. Ballandras, W. Daniau, B. Gautier, J.C. Labrune, and D. Barbier

Structural and dielectric characterization of BST and STO thin films for microwave application
J. Bellotti, E.K. Akdogan, and A. Safari

Dielectric behavior of doped and pure SrTiO$_3$ under DC bias
A. Chen, A. Bhalla, Z. Yu, R. Guo, and L.E. Cross

Optimizing (Ba,Sr)TiO$_3$ thin films for tunable microwave device applications

Bismuth pyrochlore dielectric films

Microwave absorber using dielectric and magnetic composite material

Magnetron sputtered Ba$_{0.5}$Sr$_{0.5}$TiO$_3$ thin films
E.J. Cukauskas, S.W. Kirchoefer, and J.M. Pond

Ferroelectric and Dielectric Films

Ferroelectric properties of (Pb$_{1-x}$La$_x$)$_3$TiO$_3$ graded thin films prepared by pulsed laser deposition process
H.-F. Cheng, G. Jann, K.-S. Liu, and I.-N. Lin

Smart heterostructure PZT/NiTi multilayer thin films
J. Cheng, D. Xu, and Z. Meng

A new silicon-based ferroelectric sandwich structure
T.-L. Ren, L.-T. Zhang, L.-T. Liu, and Z.-J. Li

Design of a new ferroelectric-silicon integrated microphone and microspeaker
T.-L. Ren, L.-T. Zhang, L.-T. Liu, and Z.-J. Li

Surface layer consideration of ferroelectric thin films for integrated ferroelectric device applications
D. Xiao, J. Zhu, J. Zhu, and L. Shen

The leakage current of Ba$_{0.5}$Sr$_{0.5}$TiO$_3$ thin films prepared by pulsed laser deposition
F. Yan and Y. Wang

Electrical properties of PZT thin films on Al-Ti electrodes
O. Blanco, J.I. Heiras, J.M. Siqueiros, and J. Portelles

SrBi$_2$Ta$_2$O$_9$ ferroelectric films deposited by PLD
M. Cruz, J.M. Siqueiros, and J. Portelles

(1-x)SrTiO$_3$ - xPbTiO$_3$ thin films by sputtering on Pt/TiN$_2$ and RuO/TiN$_2$ electrodes
E. Martinez, A. Fundaro, and J.m. Siqueiros

Influence of cyclic mechanical and electrical load on the properties of PZT(53/47) films on metallic substrates
T. Hauke, H. Beige, M. Giersbach, S. Seifert, and D. Sporn

Ferroelectric properties of face-to-face annealed Sr$_{0.3}$Bi$_{2}$Ta$_{2}$O$_{9}$ thin films
K. Aizawa, K. lizuka, E. Tokumitsu, and H. Ishiwara

Epitaxial growth of tungsten bronze (Sr,Ba)Nb$_2$O$_6$ thin films by chemical solution deposition
R. Aoyagi, S. Okamura, T.
ISAF 2000 PAPERS

Nishida, and T. Shiosaki
Epitaxial growth of MgO buffer layer and electrode layer on Si for Pb(Zr,Ti)O₃ by PLD
X.M. Li, A. Sakurai, K. Shiratsuyu, K. Tanaka, and Y. Sakabe
Characterization of residual strain in epitaxial Pb(ZrₓTi₁₋ₓ)O₃ thin film prepared by pulsed-introduced MOCVD
K. Saito, I. Yamaji, T. Akai, K. Ishikawa, K. Nagashima, and H. Funakubo
Preparation of lead titanate and PZT ultra-thin film using Langmuir-Blodgett film as precursor
H. Sugai, T. Iijima, and H. Masumoto
Plasma etching of PZT capacitor using ISM plasma source for ferroelectric memory application
M. Ueda, M. Endo, K. Suu, J. Ortega, and D. Johnson
Low temperature preparation of sol-gel PZT thin film annealed at 160°C by the hydrothermal method
Z. Wei, K. Yamashita, and M. Okuyama
Control of (111) preferred orientation of PbZrₓTaᵧTi₁₋ₓO₃ thin films using PbTiO₃ seeding layer
C.J. Kim, K.-M. Lee, and I. Chung
Residual stresses in the electrode of Pt/Ti for the thermal detector with thin-film structure
K. Kim, S. Lee, D. Kim, and M. Lee
Giant grained platinum electrodes for ferroelectric devices application
D.-S. Lee, D.-Y. Park, S.-H. Kim, H.-J. Woo, and J. Ha
Orientation dependant ferroelectric properties of SrBiₓTaO₉
S.E. Moon, S.B. Back, S.-I. Kwun, T.K. Song, and J.G. Yoon
Relaxor behavior and electromechanical properties of MgO dispersed-Pb(Mg₀.₃₃Nb₀.₆₆)O₃-PbTiO₃ (90/10) nanocomposite thin films
D. Park, J.-K. Lee, De-S. Cheong, and J.-W. Park
Effects of gas ambient (O₂ OR N₂) during crystallization and recovery annealing on ferroelectric properties of Pt/SBTN/PT capacitors
W.S. Yang, S.J. Yeong, J.S. Roh, and C.T. Kim
A study on the switching charasteristics of PLT(10) thin films
S.J. Kang, D.H. Chang, and Y.S. Yoon
Displacement property of PZT films prepared by CSD method
T. Iijima, Z. Wang, G. He, and N. Sanada
Growth evolution, morphology, and microstructure of epitaxial SrBiₓNb₂O₉ film
J. Lettieri, M.A. Zurbuchen, S.K. Streiffer, M.E. Hawley, and D.G. Schlom
Synthesis and ferroelectric effect in [1-xSrBiₓ₂Nb₂O₉ - x Bi₃TiNbO₉] films
R. Megarejo, M.S. Tomar, A. Hidalgo, and R.S. Katiyar
Effect of hydrogen on (Pb,La)(Zr,Ti)O₃(PLZT) thin film capacitors with Pt or IrO₂ top electrode
S.-G. Yoon, D. Wicaksana, D.-J. Kim, and A.I. Kingon
Orientation dependence of ferroelectric properties of epitaxially grown Pb(Zr,Ti)O₃ films
H. Funakubo, K. Nagashima, and M. Aratani
Evaluation of CSD PZT thick films with different film density
K. Maki, N. Soyama, S. Mori, and K. Ogri
Preparation of Ir-based thin film electrodes by MOCVD
M. Shimizu, K. Kita, H. Fujisawa, N. Tomozawa, and h, Niu
Influence of Nb dopant on the properties of lead titanate thin films
T. Ohno, D.S. Fu, T. Ogawa, H. Suzuki, and K. Ishikawa
CHARACTERIZATION
The use of charging effects in ferroelectrics as an investigation technique in the SEM
L.S. Kohanchik
Domain structures of PbTiO₃ single crystals and thin film by Kelvin force microscope
Nonlinearity measurements of piezoceramic transducers with burst excitation
A. Albareda, J.A. Casals, and R. Pérez
Effects of structure ordering and DC-field on relaxor/ferroelectric...
behavior of complex perovskites
L.S. Kamzina and N.N. Krainik

Optimal determination of materials properties
M. Duan, S.M. Pilgrim, M. Huger

Ultrasonic ranging
H. Monsef and R.K. Moridifar

Nanoscale characterization of chemical solution deposited PbTiO$_3$ thin films with scanning force microscopy

Optical characterization of reliability in perovskites
M. Biegalski, Y. Tsur, and S. Trolier-McKinstry

Cryogenic characterization of ferroelectric materials
C. Pagoda, S.M. Pilgrim, S.T. Misture, and D.A. Earl

Spatial variation of ferroelectric properties in Pb(Zr$_{0.39}$Ti$_{0.7}$)O$_3$ thin films studied by AFM

Domain structures in the incommensurate phase of Pb(Zr$_{0.95}$Ti$_{0.05}$)O$_3$
S. Watanabe and Y. Koyama

Simultaneous observation of ferroelectric domains and surface morphology using scanning nonlinear dielectric microscopy
H. Odagawa and Y. Cho

A theory for the image production mechanism of scanning nonlinear dielectric microscopy and its application to the quantitative evaluation of linear and nonlinear dielectric properties of ferroelectric and piezoelectric materials
Y. Cho, K. Ohara, S. Kazuta, and H. Odagawa

ISAF 2000 PAPERS

A novel real-time angular displacement sensor
J. Puttappa and S.Y. Luen

Germey

A ferroelectric frequency-doubling material - potassium lithium niobate
Y. Wan and J. Chu

Optics and Displays

A study of optical properties of SrBi$_2$Ta$_2$O$_9$ thin films by spectroscopic ellipsometry

Compositional and micro-structural studies of PZT ferroelectric cathodes
S. Zhang, X. Cai, C. Zhong, and X. Zhou

Variable optical attenuator based on deformed helix ferroelectric liquid crystals
F. Podgormov, E. Pozhidaev, D. Ganzke, and W. Haase

Electrical properties of ferroelectric PLZT
M. Ichiki, Y. Morikawa, and M. Tanaka

Ferroelectricity Newsletter
including all back issues is available on Internet
http://www.sp.nps.navy.mil/projects/ferro/ferro.html
in Adobe Acrobat PDF file format

The PDF file format maintains the graphics and organization of the printed newsletter. Adobe Acrobat Reader is a helper application distributed free for Web browsers. Acrobat is available for Macintosh, Windows, DOS, SGI, and Sun SPARC operating systems.

If you want a hard copy of the newsletter, you must let us know by
fax: +831-655-3734 e-mail: liebmann@redshift.com or rpanholzer@nps.navy.mil
mail: Hannah Liebmann, 500 Glenwood Cir., Ste 238, Monterey, CA 93940-4724 USA
SIX EXTENSIVE STUDIES OF KEY INDUSTRIES AND TECHNOLOGIES:
TECHNICAL INSIGHTS
Published by John Wiley & Sons, Inc., Technical Insights brings extensive studies of the following key industries and technologies:

Advanced Ceramics
Covering a broad spectrum of cutting-edge advanced ceramics, this report brings exciting applications that are in development:
- Ceramic components in fuel cells for near-emission-free engines
- Cockpit armor for military aircraft
- Oil spill containment booms
- A prosthetic eye that looks and moves like a real eye
- A gelcasting technique that can be used to make silicon nitride nozels, blades, and wheels
- Fused deposition modeling of commercial grade silica powder
- Superplastic net-shape forming of nanophase ceramics

Engineering Polymers
The polymer/plastics industry has grown to be larger than the aluminum, copper, and steel industries combined. This report examines the potential for market growth in the automotive, aviation/aerospace, electrical/electronic composites, medical, and industrial/consumer sectors. It also looks at ongoing advances in composite bonding, fabric prepreg, photopolymerization, selective laser sintering, probes for detecting motions, injection molding, plastics recycling, stereolithography, and two-shot molding.

Nanophase Materials
Nanomaterial applications include nanoelectronics, metallurgy, biotechnology, cosmetics, space exploration, nanomedicine, optics, food industry, metrology and measurement, ultraprecision engineering, and pharmaceutical and chemical industries. In this report you will learn about
- Electronic thin films, nanowires, quantum dots
- Trend toward small in macro-world and micro-world
- Computer speed and memory jumps
- Molecular devices that hold random access memory (RAM)
- Vast storage capacity
- Competitor for Group III-V materials: nanophase Si
- Potential to lower cost, smaller, faster, more versatile products

Optical Coatings
Prospects for this burgeoning field are expanded functions beyond antireflectors-chemical, environmental, and abrasion resistance; climate control; EMI shielding; optical fibers and filters; transmissive electrodes; electronic display screens; and architectural and automotive windows and mirrors. Optical Coatings examines five key areas with important recent advances:
- New sputtering techniques for large areas
- Sol-gel technology for ferroelectric thin films, nanocomposites, thermal barrier coatings, and more
- Suspended particle device technology, a revolutionary material for smart windows, mirrors, sunroofs, and sunvisors
- Diamond-like carbon coatings for wear/corrosion protection of magnetic storage media; low-dielectric insulators for interconnects of ultra-large integration chips
- Amorphous coatings that exhibit minimal light scattering
QUASICRYSTALS
Noval materials spur markets for composites, surface coatings, thermoelectric devices, and hydrogen storage.
This report features
- description of the scientific and technological nature of quasicrystals and their benefits
- overview of the major players in the field. Leading centers of research are listed alphabetically and by country
- highlights of current research; covers research into applications for quasicrystals and basic research.

COMPREHENSIVE INTRODUCTION TO FUNDAMENTALS OF FERROELECTRICS
FERROELECTRIC DEVICES
by Kenji Uchino
This versatile reference/text provides information about available materials, device designs, drive/control techniques, and essential applications and examines high-permittivity dielectrics, piezoelectric devices, pyroelectric sensors, and electrooptic devices.

Featuring the author's exclusive device development method, Ferroelectric Devices
- analyzes multilayer, bimorph/moonie, and flexible composites
- explains the uses of PTC (positive temperature coefficient of resistivity) effects
- covers electrostriction, anharmonicity, polarization reversal, paraelectricity, and other phenomena
- illuminates ferroelectric volatile and nonvolatile memory development
- showcases “sensing” and “activating” functions in pyroelectric and piezoelectric materials
- examines Eigen lattice vibration modes in various crystals
- describes shear stress and strain configurations
- surveys applications of ferroelectric ceramic multilayer structures in capacitors, actuators, and electrooptic components.

Containing more than 800 references, drawings, and photographs, Ferroelectric Devices serves as an excellent reference for materials, electrical, electronics, optical, electromechanical, solid-state, and robotics engineers, and a superb text for upper-level undergraduate and graduate students in these disciplines.

HANDBOOK OF THIN FILM DEVICES: FRONTIERS OF RESEARCH, TECHNOLOGY, AND APPLICATIONS
by Maurice H. Francombe
The fastest growing areas of solid state technology are presently dominated by thin-film devices and circuit assemblies. Requirements in the commercial, military, and space development arenas have resulted in a greatly increased focus on micro-volume devices and circuit architectures in high-density, integrated solid-state subsystems. Such subsystems often embody, in addition to electron devices, newly developed magnetic, superconducting, dielectric, acoustic, and optical thin film components, providing functions not otherwise available in semiconductors.

This handbook is the first multi-topical review and comprehensive reference work to address these interdisciplinary needs. The five topical volumes have been organized by editors who are well-known authorities in the areas of semiconductor, optical, superconducting, magnetic, and ferroelectric film devices. The close familiarity and involvement of these editors with thin film device research and development programs in government, industry, and university laboratories, has ensured that world-recognized experts from these institutions were invited to contribute and review chapters. The result is a well-balanced selection of articles, covering all aspects of thin film devices ranging from basic device physics and design, through growth and device fabrication, performance characteristics, to applications and integrations into subsystems.
The volume headings of the *Handbook of Thin Film Devices* are:

**Volume One**  
*Hetero-Structures for High Performance Devices*, edited by Colin E.C. Wood

**Volume Two**  

**Volume Three**  
*Superconducting Film Devices*, edited by Phillip Broussard

**Volume Four**  
*Magnetic Thin Film Devices*, edited by J. Douglas Adam

**Volume Five**  
*Ferroelectric Film Devices*, edited by Deborah J. Taylor

**JOURNAL OF ELECTRO CerAMICS**  
Editor-in-chief Harry L. Tuller  
Electroceramics are playing an increasingly important role in many key technologies including communications, energy, electronics, and electronic packaging, and automation. This derives from their versatility in:

- piezo-, ferro-, and pyroelectricity  
- electro- and nonlinear optical properties  
- ferromagnetism  
- insulating to metallic and fast ion conductivity

These, combined with thermal, mechanical, and chemical stability in aggressive environments often render them the only viable materials choice. The performance of electroceramic materials depends on a complex interplay between processing, chemistry, and structure.

For the first time, *Journal of Electroceramics* provides as forum for discussion cutting across issues in electrical, optical, and magnetic ceramics. Driven by the need for miniaturization, cost, and enhanced functionality, the field of electroceramics is experiencing for rapid growth in many new directions. The journal encourages discussions of resultant trends concerning silicon-electroceramic integration, ferroelectric memories, high and low dielectric materials, nanotechnology, sensors, actuators, ceramic-polymer composites, grain boundary, and defect engineering.

*Journal of Electroceramics* publishes original research papers on both scientific and technical aspects of electroceramics. On a timely basis feature articles and special issues serve to highlight recent progress and future trends in the various subfields.

They include the areas of oxide electronics, ionic and mixed conductors, actuators and sensors, boundary controlled devices, electronic packaging, dielectrics, optoelectronics, magnetic recording, and superconductivity.
Smart structures utilize active materials as sensors and actuators to sense and respond to their environment. These include piezoelectrics, electrostrictives, magnetostrictives, and shape memory alloys (SMA). Development of smart structures involves the integration of active and passive materials systems, often including the coupling of relevant mechanical, electric, magnetic, thermal, or other physical properties. This can subject the active materials to large stress levels, cyclic loads, thermal loads, or environmental loads that result in degradation of material properties. Meeting the materials needs of the smart structures community over the coming decade and beyond will require the development of new active materials, further characterization of new and existing active materials, and developing models of material behavior and material failure suitable for reliable structural design. This conference will bring together researchers from the materials, mechanics, and applications communities with common interests in material properties.

Topics

Development of Active Materials
- Single crystal and polycrystalline materials: Ferroelectrics, SMA, and magnetostrictives
- High-temperature ferroelectrics and SMA
- Ferromagnetic SMA
- Low-temperature magnetostrictive materials
- Thin film active materials for structural applications, e.g., flow control

Active Materials Characterization
- Constitutive behavior: Composition/structure/property relations, coupled field characterization, micromechanics models, macro scale models
- Reliability: Fracture toughness, fatigue crack growth, field coupled fracture, fracture mechanics of active materials, fatigue life prediction for both SMA and ferroelectrics, other failure models and mechanisms, e.g., aging, depoling, dielectric breakdown, Curie temperature, creep, etc.

Active Composite and Structural Elements
- Ferroelectric composites (including unimorph, bimorph, patch), SMA composites, magnetostrictive composites, smart polymer composites, hybrid active material systems, cofired and stack ferroelectric actuators, torque tubes

Contact
Dr. Doru Lupascu, FB Materialwissenschaft,
FG Nichtmetallisch-Anorganische Werkstoffe
Petersenstrasse 23
D-64287 Darmstadt, Germany
phone: +49-6151-16-6316, +49-6151-16-6302; fax: +49-6151-16-6314;
lupascu@ceramics.tu-darmstadt.de; www.tu-darmstadt.de/fb/ms/fg/naw/
Upcoming Meetings
6th International Symposium on Ferroic Domains and Mesoscopic Structures (ISFD-6) 29 May-2 Jun 00 No.1, p.12
MRS Workshop on High-\textit{k} Gate Dielectrics 1-2 Jun 00 No.1, p.13
MRS Workshop on Transparent Conducting Oxides (TCOs) 19-20 Jun 00 No.1, p.14
12th American Conference on Crystal Growth and Epitaxy (ACCGE-12) 13-18 Aug 00 No.1, p.15
3rd (8) International Seminar on Ferroelastics Physics [ISFP-3(8)] 11-14 Sep 00 No.2, p.16
Materials Week 25-28 Sep 00 No.2, p.17
SPIE's 2000 Symposium on Microelectronic Manufacturing 18-19 Sep 00 No.3, p.29
2000 Fall Materials Research Society Meeting 27 Nov-1 Dec 00 No.3, p.30
13th International Symposium on Integrated Ferroelectrics (ISIF 2001) 11-14 Mar 01 No.3, p.32
2001 Spring Materials Research Society Meeting 16-20 Apr 01 No.3, p.33
8th International Conference on Ferroelectric Liquid Crystals (FLC 2001) 5-11 Aug 01 No.3, p.34
10th International Meeting on Ferroelectricity (IMF-10) 3-7 Sep 01 No.3, p.35
"Active Materials: Behavior and Mechanics," Part of SPIE's 8th International Symposium on Smart Structures and Materials 5-8 Mar 01 No.4, p.22

Conference Reports

Index of Conference Papers
2nd Asian Meeting on Ferroelectricity (AMF-2), Singapore 7-11 Dec 98 No.1, p.2
17th Conference on Crystal Growth and Epitaxy, Fallen Leaf Lake, California 4-7 Jun 00 No.1, p.10
9th European Meeting on Ferroelectricity (EMF-9) Prague 12-16 Jul 99 No.2, p.2
12th IEEE International Symposium on the Application of Ferroelectrics (ISAF 2000) 31 Jul-2 Aug 00 No.4, p.2

Publications
\textit{Technical Insights} No.4, p.19
\textit{Ferroelectric Devices} No.4, p.20
\textit{Handbook of Thin Film Devices} No.4, p.20
\textit{Journal of Electroceramics} No.4, p.21

IEEE Sensors Journal
This new, peer-reviewed professional society journal devoted to sensors is now accepting paper submissions and subscriptions for 2001.
The journal is organized by a group of dedicated volunteers and is backed by the IEEE Sensors Council. The council consists of 26 member societies with a combined membership of 260,000. The call-for-papers and other relevant information can be found on the Sensors Council website: \url{www.ieee.org/sensors}.
The IEEE Sensors Journal will start publication in June 2001. The inaugural issue is being dedicated to review papers – 41 such papers are in preparation.
For the list of titles and subscription information, please visit the website.
## CALENDAR OF EVENTS 2000

<table>
<thead>
<tr>
<th>Month</th>
<th>Event Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nov 27- Dec 1</td>
<td>MRS 2000 Fall Meeting, Boston, Massachusetts, USA (see p. 30)</td>
</tr>
<tr>
<td>Dec 3-6</td>
<td>Session on “Tunable Microwave Devices and Circuits,” Asia Pacific Microwave Conference (APMC 2000), Sydney, Australia. Contact: <a href="mailto:gsubrama@engr.udayton.edu">gsubrama@engr.udayton.edu</a></td>
</tr>
<tr>
<td>Dec 12-15</td>
<td>3rd Asian Meeting on Ferroelectrics (AMF-3), Hong Kong, China (see Ferroelectricity Newsletter, Vol. 7, No. 3, p. 19)</td>
</tr>
</tbody>
</table>

### 2001

<table>
<thead>
<tr>
<th>Month</th>
<th>Event Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mar 5-8</td>
<td>“Active Materials: Behavior and Mechanics (ss08),” Part of SPIE’s 8th International Symposium on Smart Structures and Materials, Newport Beach, California, USA (see p. XX)</td>
</tr>
<tr>
<td>Mar 11-14</td>
<td>13th International Symposium on Integrated Ferroelectrics (ISIF 2001), Colorado Springs, Colorado, USA (see p. 32)</td>
</tr>
<tr>
<td>Apr 16-20</td>
<td>MRS 2001 Spring Meeting, San Francisco, California, USA (see p. 33)</td>
</tr>
<tr>
<td>Aug 5-11</td>
<td>8th International Conference on Ferroelectric Liquid Crystals (FLC 2001), Washington, D.C., USA (see p. 34)</td>
</tr>
<tr>
<td>Sep 3-7</td>
<td>10th International Meeting on Ferroelectricity (IMF-10), Madrid, Spain (see p. 35)</td>
</tr>
</tbody>
</table>