Ferroelectricity Newsletter

A quarterly update on what's happening in the field of ferroelectricity

Volume 1, Number 1 December 1992

INFORMATION EXCHANGE IS THE PURPOSE OF THIS NEW PUBLICATION

Ferroelectric materials appear in a broad range of devices, ranging from acoustic transducers, through electro-optic modulators, to capacitors. The phenomenon of ferroelectricity is also studied in diverse ways, ranging from neutron scattering, through electrical measurements, to first-principles calculations.

This breadth exerts a centrifugal force on the field and inhibits full exploitation of the synergies amongst the researchers working on different aspects of ferroelectrics.

By sponsoring the start-up of this newsletter, we hope to exert a centripetal force on the research community. This exchange of information should foster in the first stage awareness, in the second stage communication, and finally direct links between research specialties.

We expect this cross-fertilization will accelerate research efforts across the entire field, providing benefits to those studying ferroelectrics both from fundamental and applied perspectives.

Jane A. Alexander
Defense Advanced Research Projects Agency

Wallace A. Smith
Office of Naval Research

WHAT INFORMATION DOES THIS NEWSLETTER PROVIDE?

The designation, Volume 1, Number 1, never fails to raise all kinds of expectations. The *Ferroelectricity Newsletter* intends to meet them by providing information about upcoming meetings worldwide, highlights of recently held conferences, lists of papers to be published in proceedings, reports on research, patents, and other important developments, as well as a calendar of events in each issue, and a yearly index.

Additional features, such as a list of societies involved in fundamental and applied fields of ferroelectricity and an overview of scientific journals, are planned for future issues. We are also working on a comprehensive mailing list of the ferroelectric community.

In our difficult economic climate, efficient networking is more important than ever before. Since resources are limited, the last thing we can afford is duplication of research efforts. The *Ferroelectricity Newsletter* will keep you in touch with ongoing research and resulting developments.

This newsletter is a product of teamwork. We invite you to join us by giving us feedback.

Rudolf Panholzer
Editor-in-Chief

IN THIS ISSUE

Ferroelectricity Newsletter

Volume 1, Number 1
December 1992

The *Ferroelectricity Newsletter* is published quarterly by the Naval Postgraduate School, Space Systems Academic Group, Monterey, California, with the support of the Defense Advanced Research Projects Agency (DARPA) and the Office of Naval Research (ONR).

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ISIF 92 PROCEEDINGS

The following papers given at the Fourth International Symposium on Integrated Ferroelectrics on 9-11 March 1992 in Monterey, California, will be published in the *ISIF 92 Proceedings*.

To obtain a copy of the Proceedings, send a check of $55, payable to Ferroelectric Symposium, to Alona S. Miller, ISIF Coordinator, University of Colorado at Colorado Springs, PO Box 7150, Colorado Springs, CO 80933-7150.

Integrated Ferroelectric Devices

Preparation of Ferroelectric Thin Films for Si-Based Devices
H.-G. Kim

A Low-Density Ferroelectric RAM
H. Yoshimori, H. Nakano, T. Mihara, H. Watanaba, C. A. Paz de Araujo, and L.D. McMillan

Thin Films by Multiple Target Reactive
M. Toyama

NDRO FERRAM: Design and Integration
D.R. Lampe, D.A. Adams, S. Sinharoy, and H. Buhay

Electrical Characteristics of High Dielectric Constant Materials for Integrated Ferroelectrics
M. Azuma, M. Scott, E. Fujii, T. Otsuki, G. Kano, and C.A. Paz de Araujo

Molecularly Modified Alkoxide Precursors (MMAP) for Thin Film Ferroelectrics
P.P. Phule

Characteristics of Lithium Niobate Based Capacitors and Transistors
E.B. Smith, H. Lin, T.A. Rost, and T.A. Rabson

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CONFERENCE REPORTS

8TH INTERNATIONAL SYMPOSIUM ON THE APPLICATIONS OF FERROELECTRICS

The eighth International Symposium on the Applications of Ferroelectrics was held in Greenville, South Carolina, from 30 August to 2 September 1992. It was attended by approximately 260 scientists and engineers who presented nearly 200 oral and poster papers.

On each day, the technical sessions were led by plenary talks. The three plenary presentations covered ferroelectric materials which are currently moving into commercial exploitation or have a strong potential to do so. These were:

- A review of pyroelectric imaging, by Bernie Kulwicki and coworkers of Texas Instruments, where arrays of pyroelectric sensors are being successfully produced for infrared imaging.
- A review of ferroelectric materials integrated with silicon for use as micromotors and microsensors, by Dennis Polla of the University of Minnesota.
- A review of research activity in Japan on high permittivity materials for DRAMs, by Yoichi Miyasaka of NEC. It is believed that future generations of silicon based microelectronic memories will require high permittivity ferroelectric materials for static capacitors due to the shrinking dimensions of the devices. This will push ferroelectric materials strongly into the microelectronics arena.

ISAF 92 invited papers

The following invited papers covering a wide range of topics were given at the symposium:

Pyroelectric and Electro-Optic Properties of Dual Ion Beam Sputtered Lead Titanate Thin Films
D.A. Trossell et al. — GEC Marconi Materials Technology Ltd.

Electro-Optic and Photorefractive Effects in PLZT Thin Films
S.R.J. Brueck and A. Mukherjee — Center for High Technology Materials, University of New Mexico

Processing of Ferroelectrics and Related Materials: A Review
T.R. Shrout and S.L. Swartz — Materials Research Laboratory, Pennsylvania State University

Fast Switching in Ferroelectrics: Experimental and Computer Simulation
V.Y. Shur et al. — Ural State University

Modified Lead Containing Perovskite Ceramics for Electro-Optic, Electrocaloric, Pyroelectric, and Electrostrictive Applications
A. Sternberg et al. — Institute of Solid State Physics, University of Latvia

Domain Investigation: A Select Review
J. Fousek — *Institute of Physics, Prague*

Piezoelectric and Ferroelectric Polymers
J. Scheinbeim — Rutgers State University

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CONFERENCE REPORTS

ISAF 92 *--* *continued from page 2*

Piezoelectric Transducers for Medical Ultrasonic Imaging
T.R.Gururaja — Hewlett Packard

Epitaxial Ferroelectric Thin Films for Memory Applications
R. Ramesh et al. — Bellcore

A Critical Review of Ferroelectric Thin Film Processing
O. Auciello — Microelectronics Center of North Carolina and NCSU

Processing and Characterization of Ferroelectric $BaMgF_4$ and $Bi_4Ti_3O_{12}$ Films for Nonvolatile Memory Field Effect Transistor (FEMFET) Devices
S. Sinharoy et al. — Westinghouse Science and Technology Center

Chemically Prepared $Pb(Zr,Ti)O_3$ Thin Films: The Effects of Orientation and Stress
B. Tuttle et al. — Sandia National Laboratories

Microstructure Induced Schottky-Barrier Effects in Barium Strontium Titanate Thin Films for 16 and 64 Mb DRAM Cells
J.F. Scott et al. — Department of Physics, University of Colorado

The paper by Shrout and Swartz was unusual because it represented a survey of the community on current and future trends in processing. It generated a great deal of interest and emphasized the fact that much effort continues to be put into a steady evolutionary improvement in process procedures, particularly through improved synthesis and control of the starting powders.

Ferroelectric thin film materials

A somewhat more revolutionary development is that of ferroelectric thin film materials. The papers in Greenville continued to reflect the large interest in these materials which became so apparent at the 7th ISAF held at the University of Illinois in 1990.

It was encouraging that there have been substantial strides made in both the processing and the understanding of thin films during the short intervening period. It was clear, however, that much still remains to be done before viable and reliable thin-film devices will be available in quantity in the marketplace.

It should also be noted that the growth of activity in ferroelectric thin films has brought researchers with different backgrounds and expertise into the field. If cross-fertilization is actively encouraged, this can only have a positive impact on the ferroelectrics community.

It is with this in mind that we encourage ferroelectric films to be an integral part of the ISAF and IMF meetings, rather than having thin film directed only to the specialist meetings which have evolved (Materials

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ISIF 92 PROCEEDINGS, ***cont.***

Feasibility for Memory Devices and Electrical Characterization of Newly Developed Fatigue-Free Capacitors
T. Mihara, J. Watanabe, C.A. Paz de Araujo, J. Cuchiaro, M. Scott, and L.D. McMillan

Pulsed Laser Deposition of Epitaxial and Conductive $La_{0.5}Sr_{0.5}CoO_3$Films for Ferroelectric Device Applications
J.T. Cheung, P.E.D. Morgan, and R. Neurgaonkar

$Pb(Zr_xTi_{1-x})O_3$ Thin Films by Hot Wall MOCVD
C.H. Peng and S.B. Desu

Processing and Integration

Sputtered PZT Films for Ferroelectric Devices
R. Bruchhaus, H. Huber, D. Pitzer, and W. Wersing

Influence of Platinum Based Electrodes on the Microstructure of Sol-Gel and MOD Prepared Lead Zirconate Titanate Films
G.A.C.M. Spierings, J.B.A. van Zon, M.. Klee, and P.K. Larsen

$BaMgF_4$ Thin Film Development and Processing for Ferroelectric FETs
S. Sinharoy, H. Buhay, D.R. Lampe, and M.H. Francombe

Sputtered Ferroelectric Thin Films for Dynamic Random Access Memory Applications
J.C. Lee, C. Sudhama, V. Chikarmane, J. Kim, and A.F. Tasch

Thick Films for Multilayer Substrates
K. Wakino, H. Sunahara, Y. Yoneda, Y. Sakabe, and K. Sugo

Jet Vapor Deposited PZT on Si and MIS Capacitors
C.-L. Hwang, T.-P. Ma, Y.D. Di, J.W. Golz, B.L. Halpern, and J.J. Schmitt

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ISIF 92 PROCEEDINGS, cont.

Bottom Electrodes for Ferroelectric Thin Films
H.N. Al-Shareef, K.D. Gifford, P.D. Hren, S.H. Rou, O. Auciello, and A.I. Kingon

An Aqueous, Low Temperature Process for Synthesizing PZT (53,47) Thin Films
C.-T. Lin, L. Li, J.S. Webb, R.A. Lipeles, and M.S. Leung

Ferroelectric Properties of PLZT Thin Films by MOCVD
K. Tominaga and M. Okada

Photoenhanced Chemical Vapor Deposition of $PbTiO_3$ and $Pb(Zr,Ti)O_3$ Thin Films
T. Katayama, M. Shimizu, and T. Shiosaki

Growth and Characterization of $Pb(Zr,Ti)O_3$ Thin Films on Si(100) and on Yttrium-Treated Si(100)
N.J. Wu, A. Ignatiev, M. Hartig, A. Mesarwi, and H.D. Shih

Hydrogen Depth Distributions and Refractive Index Profiles in Annealed Proton-Exchanged $LiNbO_3$
J.M. Zavada, S.W. Novak, R.G. Wilson, A. Loni, and R.M. DeLaRue

Preliminary Report on the Effects of X-Ray Irradiation upon Switching in KH_2PO_4
T.D. Usher

Conducting Oxide Electrodes for Ferroelectric Films
C.K. Kwok, D.P. Vijay, S.B. Desu, N.R. Parikh, and E.A. Hill

Plasma Enhanced MOCVD of $Ba_{1-x}Sr_xTiO_3$ Films
P.C. Van Buskirk, R. Gardiner, P.S. Kirlin, S.B. Krupanidhi, and S. Nutt

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ISAF 92 *-- continued from page 3*

Research Society Symposia, International Symposium on Integrated Ferroelectrics).

Events surrounding the sessions

As the attendees will well remember, this ISAF meeting came complete with unexpected setbacks with the conference hotel suffering a power outage on two consecutive afternoons. Despite this, the program ran on schedule. Eric Cross entertained guests by flickering candlelight at the conference banquet — giving a personal account of some of the people and personalities involved in ferroelectrics over the past 40 years. The Achievement Award was presented to Dr. Wallace A. Smith for his contributions in the field of composites.

It was also announced at the banquet that the next ISAF will be held at Pennsylvania State University in 1993, with Professor Amar Bhalla as the general chairman.

A word of thanks to all who participated in this meeting and all who contributed to making it a success. Special thanks go to Mr. Jammie White of Clemson's Continuing Engineering Education and Mr. Michael Ingram of North Carolina State University for providing organizational support.

Finally, sincere thanks go to the UFFC and IEEE sponsoring organizations and the Office of Naval Research for their financial support of the conference.

Angus I. Kingon
Technical Program Chairman
Department of Materials Science & Engineering
North Carolina State University

Gene Haertling
Symposium General Chairman
Department of Ceramic Engineering
Clemson University

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IN THE NEXT ISSUE

In addition to our regular features you will find information on

• professional societies •
• scientific journals •
• a patent report •

CONFERENCE REPORTS

4TH INTERNATIONAL SYMPOSIUM ON INTEGRATED FERROELECTRICS

In 1989 the first International Symposium on Integrated Ferroelectrics was held in conjunction with the Colorado Microelectronics Conference (CMC) in Colorado Springs with about 65 attendants. The fourth International Symposium on Integrated Ferroelectrics, which took place from 9 to 11 March 1992 at Monterey, California, attracted three times the number of participants and featured 96 papers.

Of particular interest were papers giving details on both fatigue and retention tests of the new ferroelectric thin film. This breakthrough could make existing nonvolatile memory technology obsolete and revolutionize programmable logic.

Larry McMillan of Symetrix Corporation in Colorado Springs reported that a new thin film ferroelectric material (Y-1) has been developed that exhibits the following characteristics when configured in a capacitor-like device:

- While maintaining a square hysteresis loop, remanent polarization shows less than 5% change up to 1 x 10^{12} switching cycles.
- Even at 100˚C, the switching change after 80 days storage still has 80% of its initial value.

These and other measurable characteristics indicate strongly that this new material may be far superior to any other known ferroelectric for applications involving, among others, nonvolatile memory and integrated ferroelectrics.

As this area of research matures, we will recognize relationships with other fields, such as neural networks, integrated optics, and monolythic microwave integrated circuits (MMICs). In the process of expanding applications, an overlapping of fields, particularly with the area of microsensors, becomes evident.

Papers presented at the Symposium

A wide range of topics was discussed at the conference and included the following fields:

- Integrated ferroelectric devices
- Processing and integration
- Theory and testing
- Optical and pyroelectric devices.

A section called Late News Invited Papers attracted special interest since these presentations dealt with the development of fatigue-free thin films. For a list of papers published in the *ISIF 92 Proceedings* see the article *ISIF 92 Proceedings* beginning on page 2.

Events integrating work and leisure

"International Cooperation and the Application of Integrated Ferroelectrics in Consumer Electronics" was the title of the conference **luncheon keynote** given **by Dr. Gato Kano**, director of the Electronics Research Laboratory of Matsushita Electronics Corporation in Osaka, Japan.

Dr. Kano explained how today's technology trends of power reduction

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ISIF 92 PROCEEDINGS, cont.

Barrier Mechanism of Pt/Ta and Pt/Ti Layers for $SrTiO_3$ Thin Film Capacitors on Si
K. Takemura, T. Sakuma, S. Matsubara, S. Yamamichi, H. Yamaguchi, and Y. Miyasaka

Switching Kinetics of Ferroelectric Fatigue-Free Material
J.D. Cuchiaro et al.

Standardized Ferroelectric Capacitor Testing Methodology for Nonvolatile Semiconductor Memory Applications
S. Bernacki, L. Jack, Y. Kisler, S. Collins, S.D. Bernstein, R. Hallock, B. Armstrong, J. Shaw, J. Evans, B. Tuttle, B. Hammetter, S. Rogers, B. Nasby, J. Henderson, J. Benedetto, R. Moore, R. Pugh, and A. Fennelly

Effect of Low Pressure Glow Discharge on Laser Ablated Ferroelectric $Pb(Zr,Ti)O_3$ Thin Films
D. Roy and S.B. Krupanidhi

Low-Energy Oxygen Ion Bombardment Induced Effects in Ferroelectric $Pb(Zr,Ti)O_3$ Thin Films
H. Hu and S.B. Krupanidhi

Theory and Testing

A Theory of Polarization Reversals in Finite Systems
Y. Ishibashi

Aging and Fatigue in Bulk Ferroelectric Ceramics
G. Arlt

Electrochemical Models of Failure in Oxide Perovskites
S.B. Desu and I.K. Yoo

Separation of Bulk and Interface Effects on the Fatigue of PZT Thin Films
N. Abt

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ISIF 92 PROCEEDINGS, cont.

Anomalous Fatigue Behavior in Zn Doped PZT
B.M. Melnick, M.C. Scott, C.A. Paz de Araujo, L.D. McMillan, and T. Mihara

Size and Screening Charge Effects in Thin Ferroelectric Films
A.S. Carrico, C.A. Paz de Araujo, T. Mihara, H. Watanabe, and J.F. Scott

High Quality Lead Zirconate Titanate Films Grown by Organometallic Chemical Vapor Deposition
M. DeKeijser, G.J.M. Dormans, P.J. Van Veldhoven, and P.K. Larsen

Measurement and Simulation of Partial Switching in Ferroelectric PZT Thin Films
L.T. Clark, T. Gloerstad, R.O. Grondin, and S.K. Dey

Characterization of Conduction in PZT Thin Films for Ferroelectric Memory Applications
X. Chen, A.I. Kingon, L. Mantese, O. Auciello, and K.Y. Hsieh

Characteristics of Barium Magnesium Fluoride (BMF) Based MIS Capacitors and MFSFETs
T.S. Kalkur

Fatigue Properties of PZT Thin Films Prepared by Sol-Gel Method
H. Watanabe, T. Mihara, et al.

Aging of Volatile and Nonvolatile Components of the Remnant Polarization in PZT
J. Kulkarni and N. Abt

Decay of Remnant Polarization in Ferroelectric Films Using Polarization Dependent Photovoltages
P.S. Brody and B.J. Rod

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and fine patterning in the semiconductor field impact home electronics by down-sizing and making machines portable. He estimated that the average household of the future will use around 50 microprocessors, thus making advanced man-machine interfaces easily available, as well as saving on energy consumption and resources.

Integrated ferroelectric technology will impact home electronics in the following ways:

- high dielectric constant allows down-sizing and power reduction
- nonvolatile polarization opens up new possibilities
- pyro- /piezoelectric effects can be the basis of man-machine interfaces

In order to facilitate international cooperation, Dr. Kano stressed the importance of taking into account the different thinking styles of Western and Oriental countries as illustrated in the following chart:

Western countries	*Oriental countries*
Thinking	Observation
Logical	Analytical
Strategic	Tactical
Individual	Corporative
Technology oriented	Market oriented

In closing, he proposed a new kind of cooperation between the United States and Japan, one which takes advantage of the two complimentary thinking styles and focuses on our respective strength and capabilities.

A conference highlight of a different kind was the **Monterey Bay Aquarium dinner**, where participants had the opportunity to explore the facts, myths, and mysteries of the spectacular Monterey Bay at the world's largest aquarium and enjoy a sit-down dinner in front of the huge kelp tank.

Special thanks go to all who made this conference a success: each and every participant, the presenters of papers, the session chairpersons, Jim F. Scott, Technical Program Chairman, as well as the Defense Advanced Research Projects Agency, the Naval Postgraduate School, and the University of Colorado at Colorado Springs for their financial support.

Rudolf Panholzer
Chairman
Space Systems Academic Group
Naval Postgraduate School
Monterey, California

Carlos A. Paz de Araujo
Co-Chairman
Microelectronics Research Laboratories
University of Colorado at Colorado Springs
Colorado Springs, Colorado

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UPCOMING MEETINGS

The Dielectrics Society 1993 Annual Conference
5 - 7 April 1993
University of Kent at Canterbury, UK

Principal theme

Dielectric relaxation

Invited speakers

Theories of relaxation — J. Bendler, General Electric Co.
"Time is of the essence" — H. Block, Cranfield
Relaxation of surface charge — D. Das-Gupta, UCNW, Bangor
Cluster models of relaxation — L. Dissado & R. Hill, King's College, London
Fractal theories of relaxation — G. Niklasson, Chalmers University
Relaxation of injected charge — G. Sessler, Darmstadt
Scaling concepts in anomalous diffusion — G. Zumofen, ETH Zürich

Contact

Dr. John Fothergill, Department of Engineering, Leicester University, Leicester, LEI 7RH, UK; Phone Leicester (0533) 522569, Fax (0533) 522619. □

The 1993 Spring Meeting of the Materials Research Society
12 - 16 April 1993
San Francisco Marriott, San Francisco, CA

Symposium N: Ferroelectric Thin Films III

Topics

Electro-optic materials and application
Highly oriented materials
ULSI DRAM materials
Smart thin-film materials
Reactive etching
In-situ materials characterization
Micro-piezoelectric devices
Materials for nonvolatile memories
Pulsed laser deposition
Sol-gel deposition
Atomistic defects
Interface phenomena
Vapor deposition
Structure/property relations
Degradation phenomena
Electrical conductivity

Abstracts due

15 November 1992

Organizers and contacts

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ISIF 92 PROCEEDINGS, cont.

Optical and Pyroelectric Integrated Devices

Ferroelectric Ceramics and Thin Films for Pyroelectric Applications
D.A. Tossell, N.M. Shorrocks, and R.W. Whatmore

Pyroelectric CCDs for Room Temperature Operated Focal Plane Arrays
Y. Togami, M. Okuyama, Y. Hamakawa, M. Kimata, and M. Denda

Ferroelectric Thin Films for Smart Spatial Light Modulator Applications
V.H. Ozguz, S. Krishnakumar, and S.H. Lee

Electronic and Optical Applications of Thin Film Lithium Niobate
T.A. Rabson and C.H.-J. Huang

Dielectric and Electro-Optic Properties of Acetate Derived PLZT X/65/35 Thin Films
G.H. Haertling

An Optical Probe for Ferroelectric Thin Film Memory Capacitors
S. Thakoor, J. Perry, and J. Maserjian

Domains in Ferroelectric VDF/TrFE Copolymer Thin Films Investigated by a New Electro-Optical Probe Method
Y. Liu, J. Zhao, H. Gamo, and A. Kojima

Supplementary Papers

Characteristics of Lead Titanate ($PbTiO_3$) Based MIS Capacitors and MOSFETs with ZrO_2 as the Buffer Layer
T.S. Kalkur, B. Jacobs, and S.R. Smith

Low-Energy Oxygen Ion Bombardment Induced Effects in Ferroelectric $Pb(Zr,Ti)O_3$ Thin Films
H. Hu and S.B. Krupanidhi

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ISIF 92 PROCEEDINGS, cont.

High Frequency Fatiguing of Ferroelectric Capacitors
N. Abt, P. Misic, D. Zehngut, and E. Regan

Ferroelectric and Dielectric Properties of Sol-Gel and Excimer Laser Deposited Lead Zirconate Titanate and Barium Titanate Films
K.W. Bennett, P.S. Brody, B.J. Rod, L.P. Cook, and P.K. Schenck

Late News Invited Papers

May-Leonard Oscillations in Ferroelectric Thermal Lenses
J.F. Scott, T. Chen, and P.E. Phillipson

Differences Between Fatigue-Free and Degradable Integrated Ferroelectrics
C.A. Paz de Araujo et al.

Deposition of $Ba_{1-x}Sr_XTiO_3$ and $SrTiO_3$ via Liquid Source CDV (LSCDV) for ULSI DRAMs
L.D. McMillan, T.L. Roberts, M.C. Scott, and C.A. Paz de Araujo

Ferroelectric Electrode Interactions in $BaTiO_3$ and PZT
J.M. Bell and P.C. Knight □

We are interested in your feedback

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Contact us if you need further information on any item in this newsletter

UPCOMING MEETINGS

MRS, continued from page 7

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Bruce A. Tuttle, Division 1845, Sandia National Laboratories, PO Box 5800, Albuquerque, NM 87185; Phone (505) 845-8026, Fax (505) 844-2974.

Foul K. Larsen, Philips Research Laboratories, PO Box 80000, 5600 JA Eindhoven, The Netherlands; Phone (31) 40-743378, Fax (31) 40-743365.

Symposium O: Phase Transformations in Thin Films— Thermodynamics and Kinetics

Topics of contributed papers

Phase formation during deposition; effects of stresses and epitaxy; diffusion and transformation in multilayers; interfacial reactions, including solid-state amorphization; phase stability; diffusion; laser- and ion-beam-induced phase transformations; diffusive processes and transformations as relevant for applications, such as optical data storage, silicides, magnetic multilayers, and X-ray mirrors

Invited speakers

Radiation-enhanced diffusion in amorphous and single crystalline thin films — R.S. Averback

Silicide formation and transformations — L.A. Clevenger

Phase equilibria in stressed solids — W.C. Johnson

Metastable phase formation by interdiffusion — W.L. Johnson

Phase equilibria under irradiation — G. Martin

Abstracts due

15 November 1992

Organizers and contacts

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UPCOMING MEETINGS

5th International Symposium on Integrated Ferroelectrics — ISIF 93
19 - 21 April 1993
Antlers Doubletree Hotel, Colorado Springs, CO

Sessions and session chairs

Device processing and integration — N. Abt
High dielectric materials for VLSI DRAMs — J. Alexander
Ferroelectric sensors and actuators — D.L. Polla
Materials, synthesis, and processing — S. Dey
Optical applications of ferroelectric materials — G. Haertling
Applications and devices I — D. Lampe
Applications and devices II — W. Wersing
High densitiy circuits: Design, architecture, and ferroelectric ASICs — R. Womack
Ferroelectric/superconductor heterostructures — R. Ramesh
Ferroelectric DRAMs — M. Francombe
Testing — S. Desu
Theory —A. Bussmann-Holder
Sol-gel and MOD chemistry — M. Yanovskaya
Overview — G. Taylor

Abstracts due 1 November 1992

Organizer C.A. Paz de Araujo, R. Panholzer, J.F. Scott

Sponsor Defense Advanced Research Projects Agency
Naval Postgraduate School
Office of Naval Research
University of Colorado at Colorado Springs

Registration fee	Before 5 April 1993	After 5 April 1993
General	$275	$350
US Government	$225	$300
Students	$40	$60

Contact **Alona S. Miller**, Symposium Coordinator, University of Colorado at Colorado Springs, PO Box 7150, Colorado Springs, CO 80933-7150; Phone (719) 593-3488, Fax (719) 594-4257 □

Fourth International Conference on Ferroelectric Liquid Crystals
28 September - 1 October 1993
Komaba Eminence, University of Tokyo, Japan

Scope

Dynamics, physics, new materials, phase behavior and microscopy, device technology, polymer FLCs, chiral systems, antiferroelectrics, optics, interfaces, theory

Organizers

A. Fukuda, H. Takezoe, N. Koide, I. Tsunoda, H. Toriumi, and D. Demus

Sponsor

Japan Society for the Promotion of Science

Contact

Atsuo Fukuda (FLC 93 Tokyo), Tokyo Institute of Technology, Faculty of Engineering, Department of Organic & Polymeric Materials, O-okayama, Meguro-ku, Tokyo 152, Japan; Phone (03) 3726-1111, ext. 2437, Fax +81-3-3748-5369, E-mail: ytakanis@cc.titech.ac.jp □

UPCOMING MEETINGS

The Eighth International Meeting on Ferroelectricity — IMF8
8 - 13 August 1993
National Institute of Standards and Technology
Gaithersburg, MD

Scope

Phase transitions and critical phenomena
Electronic structure, quantum effects
Lattice dynamics, lattice instabilities and soft modes
First principles calculations
Low temperature properties
Superconductivity-ferroelectricity relationship
Charge density waves, polarization fluctuations
Structure and crystal growth
X-ray and neutron scattering
Acoustic and ferroelastic properties
Dielectric, piezoelectric, and pyroelectric properties
Optical properties and phase conjugation
Modulated and incommensurate systems
Disordered and glassy systems
Domains, domain boundaries, and imperfections
Raman, Brillouin, IR, submillimeter spectroscopy
NMR, ESR, PAC, and other types of spectroscopy
Electron microscopy
High pressure effects
Polymers and liquid crystals
Ceramics and composite materials
Sensors, actuators, and transducers
Thin films and surfaces
Ferroelectric semiconductor integration

Abstracts due

15 January 1993

Proceedings

Papers presented at the meeting and accepted by the referees will be published in a special issue of the journal *Ferroelectrics.* The deadline for receipt of manuscripts is 8 August 1993 at the IMF8 registration. A copy of the Proceedings will be provided to every participant.

Organizers

W.A. Smith, L.E. Cross, G.W. Taylor, K.B. Lyons, R.E. Newnham, S.J. Jang, et al.

Sponsors

National Institute of Standards and Technology
American Ceramic Society
American Crystallographic Association
American Physical Society
IEEE Ultrasonics, Ferroelectrics, and Frequency Control Society
Materials Research Society

Contact

Kathy Kilmer, IMF8 Conference Manager, National Institute of Standards and Technology, Administration Building, Room A903, Gaithersburg, MD 20899; Phone (301) 975-2858, Fax (301) 948-2067. □

UPCOMING MEETINGS

2nd International Conference on Magnetoelectric Interaction Phenomena in Crystals

13 - 18 September 1993

Centro Stefano Franscini, Monte Verita, Ascona (Ticino), Switzerland

Scope

Linear and higher order magnetoelectric, piezomagnetoelectric, and other magnetoelectric related effects

Relation between symmetry and magnetoelectric properties (tensorial, crystallographic, relativistic)

Phenomenological and microscopic theories (Landau theory of phase transitions, exchange effects)

Frontier fields (toroidal moments, kinetoelectric and kinetomagnetic effects, problems of magnetoelectricity and related symmetry phenomena in quantum magnets, e.g., anyonic systems and chiral phases)

Synthesis, structural and physical properties of magnetoelectric materials (single crystals, ceramics, composites): ordinary magnetoelectrics and complex ones, such as ferromagnetic, ferrimagnetic or antiferromagnetic ferroelectrics, antiferroelectrics and ferroelastics ("Seignettomagnetics")

Magnetoelectric effect in incommensurate crystals (modulated, intergrowth, and quasicrystals)

Magnetoelectrically monitored magnetic phases and phase transitions

Field induced effects: static magnetic field induced polarization, electric field induced magnetization, quasistatic, pulsed, dynamic, and high frequency

Optical properties (crystal optics of magnetoelectric materials in transmission and reflection; magnetoelectrically generated nonlinear optical effects)

Domains and domain walls (switching, symmetry aspects, coupling with allied fields, stress, etc.)

Elementary excitations in magnetoelectric materials

Inhomogeneity and defect induced magnetoelectric effects

Measuring techniques

Applications

Organizers

H. Schmid, A. Janner, H. Grimmer, J.-P. Rivera, Z.-G. Ye

Sponsors

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The best information is no good
if you can't put your hands on it when you need it.
With this in mind,
we have laid out this newsletter so that it fits nicely into a
3-ring binder.

CALENDAR OF EVENTS 1993

January 15	• IMF8 abstracts due (see p. 10).
March 1	• Abstracts due for the 1993 PAC RIM Meeting of the American Ceramic Society.
22 - 26	• 1993 March Meeting of the American Physical Society, Seattle, WA: Tutorial 5 on Condensed Matter Science of Fullerenes on 21 March, 8 a.m. - 12 noon. Contact The American Physical Society, 335 East 45th Street, New York, NY 10017-3485.
April 5 - 7	• The Dielectrics Society 1993 Annual Conference, Canterbury, UK (see p. 7).
12 - 16	• The 1993 Spring Meeting of the Materials Research Society, San Francisco, CA (see p. 7).
19 - 21	• 5th International Symposium on Integrated Ferroelectrics, Colorado Springs, CO (see p. 9).
July 1	• MRS 1993 Fall Meeting abstracts due
August 8 - 13	• The Eighth International Meeting on Ferroelectricity, Gaithersburg, MD (see p. 10).
September 13 - 18	• 2nd International Conference on Magnetoelectric Interaction Phenomena in Crystals, Monte Verita, Ascona, Switzerland (see p. 11).
28 - 1 Oct	• Fourth International Conference on Ferroelectric Liquid Crystals, Tokyo, Japan (see p. 9).
November 7 - 10	• The 1993 PAC RIM Meeting of the American Ceramic Society, Honolulu, HI: International Symposium on Ferroelectric Thin Films. Contact Isabel K. Lloyd, University of Maryland, Materials & Nuclear Engineering, College Park, MD 20742-2115; Phone (301) 405-5221, Fax (301) 314-9467.
29 - 3 Dec	• MRS 1993 Fall Meeting, Boston, MA. Contact Philippe M. Fauchet, Phone (716) 275-1487, Fax (716) 275-2073; David B. Poker, Phone (615) 576-8827, Fax (615) 576-6720; Alan I. Taub, Phone (518) 387-6234, Fax (518) 387-6232.

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