
Ferroelectricity Newsletter

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

Volume 6, Number 4

Fall 1998

TRIPLE MONTREUX CONFERENCE EXPANDS NOT ONLY THE SCIENTIFIC HORIZON

As we complete the sixth year of gathering information on what's happening in the field of ferroelectricity around the world, we find that the explosive growth in this area is visually reflected in the length of this newsletter: Never before did we have a single issue with 40 pages.

The reason is quite simple. We wanted to give you some idea of the breadth and depth of what was going on in Montreux last August at **Electroceramics VI**, the **European Conference on Applications of Polar Dielectrics (ECAPD IV)**, and the **11th International Symposium on Applications of Ferroelectrics (ISAF XI)**.

I think it's no exaggeration to say that the Montreux ferroelectric event was a success. And that not only with respect to its scientific content but also to the overall ambiance at the triple conference. Maybe Professor Nava Setter, General Chair, gave us a clue when she said, "The spacious and comfortable Montreux Congress Center on the shores of Lake Geneva will ensure maximum benefit from the papers presented at the Conference. The extensive social program will provide enjoyable opportunities for interaction, discussion, and exchanges."

Interaction, discussion, and exchanges, aren't these some of the most vital ingredients ensuring a sustainable 21st century, let alone a better future in general?

This way of thinking and acting seems to be on the ascendancy. In the first circular announcing the **3rd Korea-Japan Conference on Ferroelectrics**, we read: "The primary goal is to bring together the scientists in both countries working in the field of ferroelectrics to exchange ideas and friendship and create the atmosphere of mutual cooperation."

We especially welcome participation of young students. The site of the Conference, Kyungju, was the capital of the Shilla dynasty, which unified the then divided Korea in 687 A.D. The Shilla dynasty influenced other ones which followed it, and its tradition still resides in the core of modern Korea. It will be an excellent opportunity to learn about Korean history."

With this in mind, we wish all of you the best of holidays, a time of reflection to prepare for the transition into the 21st century.

Rudolf Panholzer
Editor-in-Chief

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CONFERENCE REPORT

THE MONTREUX FESTIVAL OF CONFERENCES

ELECTROCERAMICS VI

International Conference on Electroceramics and their Applications

ISAF XI

International Symposium on Applications of Ferroelectrics

ECAPD IV

European Conference on Applications of Polar Dielectrics

Montreux, Switzerland, 24-27 August 1998

Organized by the Laboratoire Ceramique of the EPFL in Lausanne headed by Prof. Nava Setter, a unique conference trilogy comprising the ELECTROCERAMICS VI (International Conference on Electroceramics and their Applications), the ISAF XI (International Symposium on Applications of Ferroelectrics), and the ECAPD IV (European Conference on Applications of Polar Dielectrics) has been held in Montreux, Switzerland, 24-27 August 1998.

As pointed out by Nava Setter during her introductory speech, two years before many members of our scientific community traveled to New Jersey, USA, then to Bled in Slovenia, and finally to Aveiro in Portugal to attend these three conferences in the period from middle of August to the first week of September 1996. The organizing committees of all three conferences agreed to have an exceptional joining of the three events this year in Montreux, at the Lake Geneva (Lac Lemman) in Switzerland. The meeting gathered 650 attendees (approximately 720 including the spouses), with the largest delegations from Japan, Germany, and the host country, followed by the USA, France, Great Britain, and with delegations from almost every other country in Europe, from Korea, China, India, Israel, Canada, Australia, and many other countries. The total number of presentations was 710, with 270 contributions for Electroceramics VI, 220 for ISAF XI, and another 220 for ECAPD IV.

A short look into the history of the three conferences shows that ELECTROCERAMICS I and II were initialized by the Belgian ceramic society and held as international conferences on electronic ceramics in Brussels in 1984 and 1988 respectively under the presidency of Prof. Duvigneaud. The third conference of this series was organized in Maubeuge, France, in 1992. Based on the success of this series and on the growing

number of participants, the Planning Committee decided in May 1992 to reduce the conference cycle time to two years. This led to the Electroceramics IV in Aachen, Germany, for which a doubling of the number of participants could be achieved over the previous event, and to the Electroceramics V in Aveiro, Portugal.

Ten years ago, in 1988, the first ECAPD and the ISAF have been held together in Zurich with 290 participants. The main topics have been ferroelectric domains and domain walls, pyroelectricity and pyroelectric sensors, piezoelectric actuators and sensors, relaxors, microwave dielectrics, electrooptic and photorefractive materials, as well as liquid crystals. There was only one paper directly referring to memories: "Large-scale use of ferroelectricity in microelectronics is reality" by E. G. Kostov and V. K. Malinovsky from the Siberian Branch of the Institute of Automation and Electrometry, Novosibirsk SBN—as seen from now, certainly a paper ten years ahead of its time.

The meeting in Montreux 1998 was preceded by an exciting summer workshop on the materials technology for ferroelectric microsensors and microactuators, organized by Paul Muralat at the EPFL (17-20 August) and by a tutorial program (21-22 August), organized by Bert Willig and Enrico Colla, covering the basics of ferroelectric and piezoelectric ceramics and thin films comprising contributions by Bob Newnham, Eric Cross, Sascha Tagantsev, Dragan Damjanovic, Marija Kosec, Paul Muralat, Rainer Waser, Angus Kingon, and Peter Günter.

The scientific program of the conference in Montreux comprised a series of plenary lectures highlighting research areas of strong current interest, three concurrent sessions of oral presentations every day, and three extended poster sessions. The plenary lectures covered the modeling of electroceramic materials and devices (R.

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Waser), the present state and future of ferroelectric memories (C. Mazuré), the structure of grain boundaries in ceramics (M. Rühle), micromechanical devices as ultrasensitive sensors (J. K. Gimzewski), photovoltaic properties of mesoporous oxide films (M. Graetzel), and a broad view into the next century with its threats and hopes and the role which electroceramics might play in the future (B. Newnham).

The fields of the concurrent sessions have been grouped around DRAMs, FRAMs, size effects, pyroelectrics, thin film processing, ferroelectrics for microsystems, conductivity, interfaces, biomaterial and glass-ceramics, IR and microwave characterization, magnetic ceramics, nonlinear optics, microwave dielectrics, capacitors and packaging, piezoelectric actuators and sensors, domains, electromechanical effects, relaxors, ferroelectrics, as well as piezoelectrics for high frequencies. The participants profited from the fact that the topics of concurrent sessions were carefully selected to show the least overlap. The whole program proved to be excellently balanced. In addition, the local organizing committee of the EPFL together with the team of the Montreux Congress Center took great care to guarantee a smooth and satisfying running of the scientific meeting, the exhibition in the lobby of the conference center, and the spouses program.

The manuscripts for the three proceedings underwent a strict reviewing process during the conference. The proceedings of the Electroceramics VI papers will appear in the *Journal of the European Ceramic Society*, those of the ISAF XI will be appear in a special issue published by the IEEE according to their tradition, and the articles of the ECAPD IV will be published in *Ferroelectrics*.

The social program of the conference was absolutely

outstanding. It started on Sunday evening with a welcome reception (sponsored by Aixtron) at the Montreux Congress Center where we met many old friends again. It continued on the second evening with a lovely cable car ride into the mountains to an old castle in a huge park. We started in the rain but on the way the weather cleared up and, while eating snacks, we watched a wonderful sunset over Lac Lemman. Tuesday evening, in warm weather and without a cloud in the sky, we took off for a wheel boat trip passing the marvelous coastline halfway to Lausanne. After the return, we were served paella at the Conference Center during an extended poster session. Wednesday we had the Conference banquet at the Casino of Montreux, including an enjoyable magician show between the courses (raising many discussions among the participants on how the maiden disappeared from the box which the magician bristled with a dozen laser swords). During the dinner, Nava Setter announced the results of the committee meetings on the locations of the next events. Before final acceptance, the designated conference chairpersons of the next events had to pass an exam set up by the magician (and after some amusing initial problems, they all passed). Now we can look forward to the next Electroceramics in Slovenia, organized by Marija Kosec, the next ECAPD in Riga, Latvia, organized by A. Krumins, and the next ISAF in Hawaii, organized by Dwight Viehland and Angus Kingon.

The Montreux trilogy of conference concluded on Thursday evening with a farewell reception at the famous medieval Castle of Chillon, where we learned about the history of the region and we also learned to appreciate the wine of the region (if we did not already). In the name of all participants, I would like to express my thanks to Nava Setter and her wonderful team for a most charming and exciting event which we will always remember.

*Rainer Waser
RWTH Aachen and FZ Jülich*

Q: Where do we find the proceedings of the three conferences?

**A: Electroceramics VI in the *Journal of the European Ceramic Society*
ECAPD IV in the journal *Ferroelectrics*
ISAF XI as a Proceedings Volume (IEEE)**

MONTREUX PAPERS

**PAPERS OF ELECTROCERAMICS VI '98, ECAPD IV '98, AND ISAF XI '98
DELIVERED 24-27 AUGUST 1998 IN MONTREUX, SWITZERLAND**

In her message to the Montreux triple conference participants, General Chair Nava Setter said: "A large number of distinguished speakers from around the world have graciously accepted our invitation to present state-of-the-art findings in the science and engineering of electroceramics, ferroelectrics and polar dielectrics. The 700 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. The balance between abstracts submitted from academic institutions and from industrial R&D laboratories is a testimony to the vitality of the field."

We are here listing the topics and authors of the papers, grouped according to fields. The proceedings of the three conferences will be published as follows:

*Electroceramics VI in the Journal of the European Ceramic Society
ECAPD IV in the journal Ferroelectrics
ISAF XI as a Proceedings Volume (IEEE)*

PLENARY SESSIONS

Modeling of electroceramics - applications and perspectives.
R. Waser

Ferroelectric memories: present state and challenges for the future.
C. Mazuré

Structure of grain boundaries in ceramics.
M. Rühle

Micromechanical devices as ultra-sensitive sensors.
J.K. Gimzewski

Optoelectronic properties of mesoporous oxide films, the nanocrystalline injection solar cell.
M. Graetzel

Electroceramics in the 21st Century.
R.E. Newnham

DRAMs

BSTO thin films for 1 Gbit DRAM applications.

R. Laibowitz

Feasibility demonstration of a multi-level thin film BST capacitor technology.

M. Watt, P. Woo, T. Rywak, L. McNeil, A. Kassam, V. Joshi, J. Cuchiario, and B. Melnick

The influence of strain on the dielectric behavior of (Ba,Sr)TiO₃ thin films deposited by LS-MOCVD on Pt/SiO₂/Si.

S.K. Streiffer, C.B. Parker, S.E. Lash, and A.I. Kingon

Control of the morphology of CSD-prepared (Ba,Sr)TiO₃ thin films.
S. Hoffmann, and R. Waser

Dielectric and charge injection properties of BST thin films for capacitor application in DRAMs.

C.S. Hwang

Experimental evidence for space charge limited ionic current transients in thin BST films.

S. Zafar, R.E. Jones, B. Jiang, P. Chu, B.E. White, D. Taylor, and S. Gillespie

Properties of BST thin films deposited by photo-assisted MOCVD.
W.W. Zhuang, Y.M. Chen, D. Ritums, Q. Zhong, N.J. Wu, and A. Ignatiev

Dielectric properties of BaTiO₃-SrTiO₃ artificially modulated structure made by MBE.
T. Tsurumi, T. Miyasou, Y. Ishibashi, and N. Ohashi

Dry-etching of barium-strontium-titanate thin films.
S. Schneider, T. Mono, B. Albrethsen-Keck, Y. Melaku, and R. Waser

FRAMS

Ferroelectric capacitor technology for nonvolatile FRAMS.
Y. Miyasaka

Polarization as a driving force in accelerated retention measurements on ferroelectric thin films.
S.D. Traynor

AFM studies on the domain orientation and piezoelectric activity

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correlations in "as-prepared" and fatigued $\text{Pb}(\text{Zr,Ti})\text{O}_3$ thin film capacitors with Pt-electrodes.

E.L. Colla, D.V. Taylor, A.K. Tagantsev, and N. Setter

Effects of texture on fatigue rate of sol-gel PZT FECAPS with reactively sputtered RuO_2 electrode layers.

G. Norga, D. Wauters, A. Bartic, L. Fe, and H. Maes

Ferroelectric memories: problems and solutions

A.I. Kingon, S.K. Steiffer, S.H. Kim, and D. Thomas

Ferroelectric $\text{Sr}_x\text{Bi}_{2-x}\text{Ta}_2\text{O}_9$ thin films deposited by MOCVD.

J.F. Roeder, B.C. Hendrix, F. Hintermaier, D.A. Desrochers, G. Bhandari, M. Chappuis, T.H. Baum, P.C. Van Buskirk, C. Dehm, E. Fritsch, N. Nagel, W. Hohnlein, and C. Mazuré

Properties of $\text{Sr}_2\text{Nb}_2\text{O}_7$ family ferroelectric thin films.

Y. Fujimori, N. Izimi, T. Nakamura, and A. Kamisawa

Structural and electrical properties of metal-ferroelectric-silicon heterostructure made by direct wafer bonding and layer transfer process.

M. Alexe, A. Pignolet, D. Hesse, and U. Gösele

CONDUCTIVITY

SOFC in dispersed power generation.

W. Drenckhaan

Protonic conduction in $\text{Ba}_3\text{Ca}_{1.18}\text{Nb}_{1.82}\text{O}_{9-d}$

H.G. Bohn, and T. Schober

Electrical characterisation of thin cathode-layer for SOFC.

D. Herbstritt, T. Egner, A. Krügel, and E. Ivers-Tifée

New cathodes in the $\text{Li}_x\text{Al}_y\text{M}_{1-y}\text{O}_2$ (M=Co, Mn) system for rechargeable lithium batteries.

Y.M. Chiang, G. Ceder, D.S. Sadoway, Y.I. Jang, B. Huang, and H. Wang

The effect of cation place exchange on the electrical conductivity of $\text{SrBi}_2\text{M}_2\text{O}_9$ (M=Ta, Nb).

D.M. Smyth, and A.C. Palanduz

Electrical conductivity and nonstoichiometry in doped $\text{Sr}_3\text{Ti}_2\text{O}_7$.

H.L. Tuller, C. Navas, and H.C. Zur Loye

Low temperature defect chemistry of oxides: general relations and case studies.

K. Sasaki, and J. Maier

Contribution to the knowledge of electrical mechanisms in tin dioxide gas sensors by physical and quasi-chemical study of point defects.

L. Poupon, P. Lacconi, and C. Pijolat

Processes leading to superconducting ceramic/metal composite tapes for industrial use.

R. Flükiger

Electrical humidity response of sol-gel processed undoped and alkali-doped $\text{TiO}_2\text{-Al}_2\text{O}_3$ thin films.

P. Innocenzi, A. Bearzotti, E. Traversa, and G. Gusmano

High-load-resistors based on doped

titanate ceramics showing an overall PTCR-behavior.

R. Moos, M. Fandel, and W. Schäfer

On linear resistivity from -1 to 103K in $\text{Sr}_2\text{RuO}_{4-d}$ single crystals grown by flux technique.

D. Pavuna, H. Berger, and L. Forro

BIOMATERIALS & GLASS-CERAMICS

Piezoelectricity, pyroelectricity, and ferroelectricity in biomaterials: a review of recent results and some speculation on their biological significance.

S.B. Lang

Decrystallisation of glass ceramics under ion exchange diffusion.

D.K. Tagantsev, and Yu. G. Korolyov

Formation and growth of semiconductor nanocrystals in phosphate glass matrix.

A.A. Lipovskii, I.E. Jakovlev, E.V. Kolobkova and V. Petrikov

Preparation and electrical properties of sol-gel derived lead zirconate titanate glass-ceramic thin films.

K. Saegusa

PIEZOELECTRIC ACTUATORS

Mecatronic using piezoelectric actuators.

P. Jänker

Commercial applications

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of passive and active piezoelectric vibration control.

S. Yoshikawa

Smart structures by integrated piezoelectric thin fibers (I): preparation properties and integration of piezoelectric fibers in the system $\text{Pb}(\text{Zr,Ti})\text{O}_3$.

D. Sporn, W. Watzka, K. Pannkoke, and A. Schönecker

Development of tube actuators by solid freeform fabrication.

A.M. Umarji, B Garibagaoglu, A.L. Kholkin, S.C. Danforth, and A Safari

Solid freeform fabrication of novel piezoelectric ceramics and composites for sensor and actuator applications.

A. Safari, and S.C. Danforth

Interaction between electrodes and ceramics in multilayer PZT.

K. Lubitz, H. Bödingner, and C. Schuh

Novel piezoelectric structures for sensor and actuator applications.

J.E. Holmes, D.H. Pearce, T.W. Button, R. Wytt, and R. Fernihough

Characterization of piezoceramic under uniaxial stress.

D. Guyomar, D. Audigier, and L. Eyraud

Relaxor-PT single crystal piezoelectric for high performance actuators and transducers.

T.R. Shrout, S.-E. Park, P.D. Lopath, and K.K. Shung

Growth of large and homogeneous PZN-PT single crystals for medical ultrasonics array transducers.

T. Kobayashi, S. Saitoh, K. Harada, S. Shimanuki, and Y. Yamashita

Piezoelectric properties and phase transitions of $\text{PbNi}_{1/3}\text{Nb}_{2/3}\text{O}_3$ - PbTiO_3 - PbZrO_3 ceramics.

M. Kondo, M. Hida, M. Tsukada, K. Kunihara, M. Kutami, and H. Kamehara

Lead based perovskite materials for high strain actuation.

C. Heremans, and H.L. Tuller

Dielectric and piezoelectric properties of $\text{Pb}(\text{Sc}_{1/2}\text{Nb}_{1/2})\text{O}_3$ - $\text{Pb}(\text{Ni}_{1/3}\text{Nb}_{2/3})\text{O}_3$ - PbTiO_3 ternary ceramic materials.

N. Ichinose, S. Natsume, and Y. Yamashita

BULK CERAMIC PROCESSING

High Performance ferroelectric thick films.

M. Kosec

Smart structures by integrated piezoelectric thin fibers (II): properties of composites and their theoretical description.

A Schönecker, U. Keitel, W.S. Kreher, D. Sporn, and W. Watzka

Formation and physical properties of piezoelectric thick film produced by gas-deposition method.

M. Ichiki, J. Akedo, A. Schroth, Y. Morikawa, R. Maeda, and Y. Ishikawa

Led-free piezoelectric ceramics of $(\text{Bi}_{1/2}\text{Na}_{1/2})\text{TiO}_3$ - KNbO_3 -1/

2. $(\text{Bi}_2\text{O}_3,\text{Sc}_2\text{O}_3)$ system.

T. Takenaka, and H. Nagata

SIZE EFFECTS

Nano-phase ferroelectric devices.

J.F. Scott

Polarization phenomena in ferroelectric thin films at the nanometer scale.

A. Gruverman, S.A. Prakash, S. Aggarwal, R. Ramesh, O. Auciello, and H. Tokumoto

Nanometer control of the ferroelectric polarization in atomically smooth $\text{Pb}(\text{Zr}_{0.2}\text{Ti}_{0.8})\text{O}_3$ thin films.

T. Tybell, C.H. Ahn, M. Foeth, P. Stadelmann, and J.-M. Triscone

Scaling and interfacial effects in ferroelectric materials.

C.A. Randall, X. Liu, D. McCauley, and T.R. Shrout

Ultra thin oriented PVDF films.

V. Fridkin

Ferroelectricity in ultra thin epitaxial $\text{Pb}(\text{Zr}_{0.2}\text{Ti}_{0.8})\text{O}_3$ films.

C.H. Ahn, T. Tybell, and J.-M. Triscone

Electrical properties of thin MOCVD PZT.

S. Bilodeau, S. Johnston, M. Russell, and P. Van Buskirk

Structure-property relations in mesoscopic BaTiO_3 and PbTiO_3 ferroelectrics.

K. Akdogan, W. Mayo, A. Safan, E.A. Payzant, W.D. Porter, C.J. Rawn, and C.R. Hubbard

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INTERFACES

Mass and charge transport involving interfaces.

J. Maier

Detailed temperature dependence of the space charged layer width grain boundaries in acceptor-doped SrTiO₃ ceramics.

R. Hagenbeck, and R. Waser

High temperature transport properties at metal/SrTiO₃ interface.

T. Kawada, N. Iizawa, M. Tomida, T. Watanabe, A. Kaimai, K. Kawamura, Y. Nigara, and J. Mizusaki

On the validity and limits of the brick layer model in impedance spectroscopy.

J. Fleig, and J. Maier

Experimental and theoretical studies of nonlinear charge transport phenomena in ferroelectric ceramics.

I. Raevski, A.N. Pavlov, M.A. Malitskaya, A.S. Bogatin, and P.F. Tarasenko

Interfacial chemistry and intergranular films in electroceramics.

Y.-M. Chian, D.A. Blom, H. Wang, and J. Luo

Restructuring the surface region of donor doped SrTiO₃ single crystals under oxidizing conditions.

R. Meyer, K. Szot, and R. Waser

The influence of grain boundaries on ionic conductivity in YSZ.

C.A.J. Fisher, and H. Matsubara

Coupled properties of polarizable semi-conductors.

M. Maglione, T. Salva, and

J. Mangin

Influence of Bi₂O₃/TiO₂, Sb₂O₃ and Cr₂O₃ doping on microstructural and electrical characteristics of ZnO based varistor ceramics.

S. Bernik, P. Zupancic, and D. Kolar

INFRARED & MICROWAVE CHARACTERISATION

Infrared and microwave dielectric response of the disordered antiferroelectric Ag(Nb,Ta)O₃ system.

J. Petzelt, E. Buixaderas, S. Kamba, J. Pokorny, J. Polivka, V. Koukal, A Kania, G.A. Komandin, A.A. Volkov, and V. Bovtoun

Extrinsic loss mechanisms in BaMg_{1/3}Ta_{2/3}O₃ and BaO-Re₂O₃-TiO₂ ceramics.

C. Zuccaro, C. Hoffmann, M. Winter, N. Klein, and R. Waser

A Raman scattering study of lead titanate thin film on MgO substrate.

R. Farhi, Y.I. Yusyuk, V.L. Lorman, and E.V. Sviridov

Dielectric response of various PLZT ceramics in the range 10²-10¹⁴ Hz and 10-550K.

S. Kamba, J. Petzelt, J. Polivka, J. Endal, J. Banys, R. Mizaras, A. Brillingas, and M. Kosec

PIEZOELECTRIC SENSORS

Current status and future trends in ultrasonic transducers for medical imaging applications.

T.R. Gurruaja

Ferroelectric ceramics and composites: statistical models for effective piezoelectric and pyroelectric properties.

W.S. Kreher, and J. Rödel

Propagation of lamb waves in 1-3 piezocomposite and its application to liquid sensors.

F. Teston, G. Feuillard, D. Certon, F. Levassort, and M. Lethiecq

Separate poling of inclusions and matrix in PT/P(VDF-TrFE) 0-3 composites.

B. Ploss, F.G. Shin, H.L.W. Chan, and C.L. Choy

Energy trapping phenomenon of piezoelectric SrBi₂Nb₂O₉ ceramics.

A. Ando, M. Kimura, and Y. Sakabe

DOMAINS

Balance of intrinsic and domain related responses in some practical ferroelectric systems.

L.E. Cross

Universal nonlinear behavior of soft PZT-piezoceramics.

V. Müller, and Q.M. Zhang

Extrinsic piezoelectric and dielectric response in ferroelectric ceramics and thin films.

D. Damjanovic

Domain wall processes and piezoelectric properties of ceramic ferroelectrics.

A.V. Turik

Ferroic microstructures - their origin

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and time evolution.

E.K.H. Salje

Domain engineering: Periodic domain patterning in lithium niobate.

V.Y. Shur, E.L. Rumyantsev, R.G. Batchko, G.D. Miller, M.M. Fejer, and R.L. Byer

Influence of defects and conductivity on the phase transitions and the domain structure properties in ferroelectric-semiconductors

$\text{Sn}_2\text{P}_2\text{S}(\text{Se})_6$.

Y. Vysochanskii, A. Molnar, and M. Khoma

Direct observation of potential distribution across ferroelectric capacitor using off-axis electron holography.

K. Honda

Scanning nonlinear dielectric microscope with submicron resolution.

Y. Cho, and K. Yamanouchi

PYROELECTRICS

Sputtering of self-polarized PZT films for IR-detector arrays.

R. Bruchhaus, D. Pitzer, M. Schreiter, and W. Wersing

Pyroelectric properties of oriented MOD $\text{Bi}_3\text{Ti}_4\text{O}_{12}$ and PZT films for sensor applications.

R.C. Buchanan

The spatial distribution of polarization and space charge in sputtered PZT thin films.

G. Suchanek, T. Sandner, R. Köhler, P. Padmini, G. Gerlach, V.P. Afanasjev, and

E.A. Tarakanov

Pyroelectric response of LiTaO_3 thin film on silicon dioxide membrane.

C.H. Kohli, P.E. Schmid, and F. Lévy

Gas spectrometry based on a pyroelectric thin film array.

B. Willing, P. Murali, N. Setter, and O. Oehler

THIN FILM PROCESSING

Microsystems, nanotechnology and ferroelectrics.

R. Whatmore

Effect of the precursor type on crystallization and microstructure of PbTiO_3 and $\text{Pb}(\text{Zr},\text{Ti})\text{O}_3$ thin films.

B. Malic, M. Kosec, K. Smolej, and S. Stavber

Preparation and electrical properties of sol-gel derived antiferroelectric $\text{Pb}_{0.99}[(\text{Zr}_{0.6}\text{Sn}_{0.4})_{0.96}\text{Ti}_{0.04}]_{0.98}\text{Nb}_{0.02}\text{O}_3$ thin films.

J.H. Jang, K.H. Yoon, and K.Y. Oh

Relationship between processing and electrical behavior of BST films deposited by spin coating.

E. Dien, M. Lejeune, and A. Smith

In situ fabrication SrTiO_3 - BaTiO_3 layered thin films by hydrothermal-electrochemical technique.

M. Yoshimura, W. Suchanek, T. Watanabe, and B. Sakurai

Electrophoretic deposition and sintering of thin/thick films of lead based electroceramics.

J. Van Tassel, and C.A. Randall

Synthesis of oriented meso-structure silica functional thin film.

H.S. Zhou, D. Kundu, and I. Honma

Preparation and electrical properties of barium titanate film and strontium titanate film by hydrothermal method.

C.-F. Kao, and C.-L. Yang

Epitaxial bilayered perovskite ferroelectric thin film heterostructures by large area pulsed laser deposition.

A. Pignolet, C. Curran, M. Alexe, S. Senz, and D. Hesse

Structural and electrical properties of epitaxial SBT thin films.

L.-R. Zheng, S. Mangenot, S.-M. Koo, and K.V. Rao

An investigation of vacancy related defects in $(\text{Pb},\text{La})(\text{Zr},\text{Ti})\text{O}_3$ capacitors using positron annihilation.

T. Friessnegg, S. Madhukar, S. Aggarwal, R. Ramesh, B. Nielsen, D.J. Keeble, and E.H. Poindexter

Influence of the deposition parameters controlled by OES on PZT thin film properties deposited by rf magnetron sputtering.

F. Ayguavives, B. Ea-Kim, P. Aubert, and B. Agius

MAGNETIC CERAMICS

Growth and properties of magneto-resistive oxide films: progress towards low field magnetoelectronics.

R. Ramesh, S.B. Ogale, M.

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Rajeswari, R.L. Greene, and T. Venkatesan

Influence of oxygen stoichiometry on electrical transport and magnetic properties of doped perovskite-type ferrate and manganate single crystals.

T. Maeder, and J.G. Bednorz

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J.-P. Mercurio, J.H. Yi, P. Thomas, and M. Manier

Fabrication and structural properties

of sol-gel derived Sr_{0.6}Ba_{0.4}Nb₂O₆ (SBN) films.

C.H. Luk, M.M.T. Ho, C.H. Mak, and K.H. Wong

Effects of a Bi₄Ti₃O₁₂ buffer layer on SrBi₂Ta₂O₉ thin films prepared by the metal organic solution deposition technique.

G.D. Hu, J.B. Xu, I.H. Wilson, W.Y. Cheung, and N. Ke

Preparation and characterization of conductive LaNiO₃ electrodes for ferroelectric capacitors by a modified sol-gel technique.

G.D. Hu, I.H. Wilson, J.B. Xu, W.Y. Cheung, and N. Ke

Stability of Pt/metal bilayer metallizations on SiO₂/Si and TiN/Si substrates.

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Low temperature process by heat treatment of SrBi₂TaNbO₉/Bi₂O₃/SrBi₂TaNbO₉ heterostructure fabricated by radio frequency magnetron sputtering.

Y.B. Park, J.W. Park, and J.K. Lee

Preparation and properties of Mn- or Nb-doped Bi₄Ti₃O₁₂ thin films by chemical solution deposition.

H. Maiwa, and N. Ichinose

Analysis of the electron-beam-induced reaction in precursor thin films of ferroelectric SrBi₂Ta₂O₉.

S. Okamura, and T. Shiosaki

Refinement of Pb(Zr,Ti)O₃ thin films grown by MOCVD.

M. Shimizu, H. Fujisawa, S. Hyodo, Y. Fujimoto, and H. Niu

Chemical solution deposition of Pb(Mg_{1/3}Nb_{2/3})O₃ thin film with PbTiO₃ seeding layers through alkoxide route.

H. Suzuki, K. Suzuki, H. Kamel, K. Ishikawa, T. Ota, and M. Takahashi

Structural and surface morphology characterizations of oriented LiNbO₃ thin films grown by polymeric precursor method.

V. Bouquet, E. Leite, and E. Longo

Pulsed laser deposition of lead zirconate titanate piezoelectric thin films from different targets.

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E.B. Araujo, and J.A. Eiras

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Zirconium titanate powders and ceramics obtained via polymeric precursors.

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Evidence of dissolution-precipitation mechanism in hydrothermal synthesis of barium titanate powders.

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Reactive sintering of phosphorous coated BaTiO₃.

J.F. Fernandez, A.C. Caballero, C. Moure, P. Duran, P. Florian, and J.-P. Coutures

Preparation and properties of (Ba_{0.6}Sr_{0.4})Bi₂Ta₂O₉ ceramic.

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Influence of additives on the grain size of barium titanate.

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Sintering of PZT powders in MW furnace at 2.45 GHz.

A. Goldstein, and M. Kravchik

Fabrication of piezoelectric particle dispersed ceramic nanocomposite.

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Aqueous processing of barium titanate ceramics.

A. Neubrand, M. Bürgers, R. Lindner, and D. Lupascu

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A. Tsoga, A. Naoumidis, W. Jungen, and D. Stöver

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A. Towata, H.J. Hwang, and M. Sando

Oxide slurries stability and powders dispersion: optimization with zeta potential measurements and rheological measurements.

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Bismuth titanate from co-precipitated precursors - a thermal study of pH dependence on stoichiometry.

A. V. Prasada Rao, and M. Suresh

New functional ceramic deposition method for MEMS.

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Fabrication of PZT thick films on silicon substrates for piezoelectric actuator.

J. Yongbae, Y. Jeon, C. Lee, H. Song, K. No, S. Kim, D. Yoon, H. Hwang, and J. Park

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Templated grain growth of perovskite ferroelectrics.

P.W. Rehrig, C. Duran, E.M. Sabolsky, S. Trolrier-McKinstry, and G.L. Messing

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Growth and characterization of lead-free single crystal piezoelectrics.

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Low-temperature sintering of Nb₂O₅-added Pb(Zr,Ti)O₃ ceramics.

K. Murakami, Y. Niwa, T. Kurita, X. Wang, and S. Kaneko

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Nanosized LaFeO₃ powders from the thermal decomposition of a heteronuclear complex for electroceramic applications.

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A. Dias, V.T.L. Buano, V.S.T. Ciminelli, and R.L. Moreira

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Iron doping effect on composition and microstructure of Bi_{2.05}Sr_{1.9}Ca_{1.05}(Cu_{1-x}Fe_x)₂O_{8+d}(0 ≤ x ≤ 0.15) samples.

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Sintering of solid solutions Pb_{0.88}Ba_{0.08}Sr_{0.04}Ti_xZr_{1-x}O₃, 0 < x < 0.55 mol% and their properties.

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A study of substitution of yttrium in BaTiO₃ ceramics.

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C.V. Do Camo, J.M. Pova, J.A. Eiras, and D. Garcia.

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PbO-doped Ba_{3.75}Nd_{9.5}Ti₁₈O₅₄ microwave dielectric resonators.

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Microwave dielectric relaxation in relaxor ferroelectrics and related disordered materials.

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The effect of cerium oxide doping on barium strontium titanate.

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Microwave dielectric properties of the (1-c)Ca(Mg_{1/2}W_{1/2})O₃-cCaTiO₃ system.

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Microwave dielectric properties of (Y_{2-x}R_x)BaCuO₅ (R=rare-earth) solid solutions.

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New temperature stabilized MW dielectrics with perovskite-like structure based on Sm-containing systems.

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Modified Ba_{6-3x}Nd_{8+2x}Ti₁₈O₅₄ microwave dielectric ceramics.

X.M. Chen, and Y.J. Wu

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The new magnetic ceramic materials based on compounds of Cu-Cr-Te and Cu-In-Cr-Se systems.

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Use of manganese zinc ferrites in high frequency ultrasonics transducers.

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Thermomechanical behavior and modellization of melt-textured YBaCuO composites containing <<Ag>> and/or <<2121>> particles.

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Superconductivity of new reduced tantalates with a layered perovskite structure.

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Magnetic field effect on the complex permeability for a Mn-Zn ferrite and its composite materials.

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T.N. Kol'tsova, G.D. Nipan, K.S. Gavrichev, A.I. Firov, and P. Manca

Interfacial reaction between Ag and NdBa₂Cu₃O_{7- ∞} superconductor prepared by low-temperature process.

S. Fujihara, G. Murakami, T. Kimura, and Y. Masuda

CALL FOR PAPERS: SPECIAL ISSUE ON APPLICATIONS OF FERROELECTRICS

The *IEEE Transactions on Ultrasonics, Ferroelectrics, and Frequency Control* is planning a special issue on Applications of Ferroelectrics, featuring expanded versions of papers presented at ISAF XI, held in Montreux, Switzerland, 24-27 August 1998, and combining these with submitted papers on topics including, but not limited to,

- ferroelectric single crystals
- ferroelectric thin devices
- ferroelectric capacitors
- piezoelectric sensors and actuators
- variable conductivity devices
- infrared and microwave devices
- ferroelectrics for microsystems
- nonlinear optical devices
- biomaterials and glass ceramics
- novel concepts for synthesizing and manufacturing ferroelectric materials.

Contributed papers should be sent to the Editor-in-Chief:

William D. O'Brien, Jr., Department of Electrical and Computer Engineering
University of Illinois, 405 North Matthews, Urbana, IL 61801 USA

Guest editor for this special issue will be Ahmad Safari, Distinguished Professor, Department of Ceramic and Materials Engineering, Center for Ceramic Research, Rutgers, The State University of New Jersey. All papers will be subject to the normal peer-review process of the *IEEE UFFC Transactions*.

The submission deadline is **1 March 1999** and the expected publication date for the special issue is early 2000.

UPCOMING MEETINGS

16th Meeting on Ferroelectric Materials and Their Applications (FMA 16)**26-29 May 1999****Co-Op Inn Kyoto, Kyoto, Japan****Topics**

- New phenomena and measurement methods
- Preparation, properties, and evaluation of materials: single crystal, ceramics, amorphous, thin film, polymer, liquid crystal, composite, etc.
- Application: capacitor, high-frequency dielectrics, sensor, PTC thermistor, piezoelectric (surface acoustic wave device, filter, actuator, ultrasonic motor, etc.), optical, pyroelectric, memory device, recording device, memory, etc.

Abstracts

Deadline: 20 February 1999

For instructions how to prepare the abstracts, see home page:

<http://msw3.aist-nara.ac.jp/ms/LABs/shiosaki/fma/index.html>

Please send abstracts to: Prof. T. Shiosaki, Graduate School of Materials Science, Nara Institute of Science and Technology, Takayama, Ikoma, 630-0101, Japan. The Program Committee will inform authors about the acceptance or rejection of their papers around the end of March. All accepted abstracts will be printed and distributed on the first day of the meeting.

Publication of Papers

Authors are encouraged to submit the papers presented at FMA 16 to the special issue of the *Japanese Journal of Applied Physics (JJAP)*. Please send manuscripts to Prof. Shiosaki by 6 May 1999. After being reviewed and accepted for publication in the *JJAP*, the papers will be published at the end of September 1999.

Language

Papers are presented in Japanese and also in English.

ContactSteering Committee: Tadashi Shiosaki, fax: +81-743-72-6049, e-mail: shiosaki@ms.aist-nara.ac.jpProgram Committee: Masanori Okuyama (Osaka University), fax: +81-6-850-6341,
e-mail: okuyama@ee.es.osaka-u.ac.jp**3rd Korea-Japan Conference on Ferroelectrics****24-26 June 1999****Kyongju, Korea**

We are pleased to announce that the 3rd Korea-Japan Conference on Ferroelectrics will be held in Kyongju, Korea, following the very successful previous ones, the first one at the Pusan National University, 1994, and the second at the Hokkaido University, 1996. The conference shall cover all areas of ferroelectrics in both theory and experiment, from basics to applications. The primary goal is to promote binational cooperation between Korea and Japan and to exchange new ideas and results on ferroelectrics research.

Presentations, oral and poster, of original research on ferroelectrics and related materials are cordially invited. Students and young researchers are particularly welcome.

UPCOMING MEETINGS**Committees**

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Prospective authors of oral as well as poster presentations should send abstracts in camera-ready form typewritten on a white sheet of good quality paper to Prof. Y. H. Jeong, Department of Physics, Pohang University of Science and Technology, Pohang, Kyungbuk 790-784, Korea, phone: + 82-562-279-2078, fax: + 82-562-279-3099, e-mail: yhj@postech.ac.kr

Proceedings

The complete paper to be included in the proceedings should be submitted on 24 June 1999 at the registration desk. After proper refereeing, the papers will be published in a special issue of the *Journal of Korean Physical Society*.

Language

The official language is English. No translation services will be provided.

Contact

Prof. Y. H. Jeong, e-mail: yhj@postech.ac.kr

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MRS PUBLICATIONS**NEW RELEASES FROM THE MATERIALS RESEARCH SOCIETY****MRS Adds New Volume to Series on Ferroelectric Thin Films**

The newest volume in a continuing series from the Materials Research Society (MRS), *Ferroelectric Thin Films VI*, documents symposium reports from the 1997 MRS Fall Meeting in Boston, MA, and contains 81 papers, 529 pages.

The volume presents a wide range of topics spanning basic academic research to applied integration issues. Fundamental materials studies, new growth methods, device and materials integration research, and developments in the design and growth of new materials, all involving epitaxial, polycrystalline and nanocrystalline ferroelectric thin films, are featured. In addition, since ULSI chip manufacturers are seriously considering incorporating ferroelectric DRAM technology into existing fabrication facilities, the industrial interest and resulting research is causing an explosion in ferroelectrics. To that end, the volume focuses on the latest technical information on ferroelectric thin films from academia, government organizations, and industry. Topics include: high-permittivity DRAM materials; domains and size effects; barriers and electrodes; bilayered ferroelectrics; Pb-based ferroelectrics; microwave and optical devices; materials for piezoelectric MEMs; and novel ferroelectric devices.

Edited by Randolph Edward Treece (Superconducting Core Technologies, Inc.), Robert E. Jones (Motorola Inc.), Christopher M. Foster (Argonne National Laboratory), Seshu B. Desu (Virginia Tech), and In K. Yoo (Samsung Advanced Institute of Technology), *Ferroelectric Thin Films VI* (ISBN: 1-55899-398-3) is Volume 493 in the MRS Symposium Proceedings Series. It is available in hardcover or microfiche for \$62.00 (MRS members), \$71.00 (US list), and \$82.00 (Non-US list).

Covalently Bonded Disordered Thin Films Explored in New Volume from MRS

The current and potential impact of covalently bonded disordered thin films is enormous. These materials are amorphous-to-nanocrystalline structures made from light atomic weight elements from the first row of the periodic table. Examples include amorphous tetrahedral diamond-like carbon, boron nitride, carbon nitride, boron carbide, and boron-carbon nitride. These materials are under development for use as novel low-power, high-visibility elements in flat-panel display technologies, cold-cathode sources for microsensors and vacuum microelectronics, encapsulants for both environmental protection and microelectronics, optical coatings for laser windows, and ultrahard tribological coatings. Researchers from 17 countries and a broad range of academic institutions, national laboratories, and industrial organizations come together in this new volume from MRS, *Covalently Bonded Disordered Thin-Film Materials*, to report on the status of key areas and recent discoveries. More specifically, the volume is organized into five sections. The first four highlight ongoing work primarily in the area of amorphous/nanocrystalline (disordered) carbon thin films: theoretical and experimental structural characterization; electrical and optical characterizations; growth methods; and cold-cathode electron emission results. The fifth section describes the growth, characterization, and application of boron- and carbon-nitride thin films.

Edited by M.P. Siegal (Sandia National Laboratories), W.I. Milne (Cambridge University), and J.E. Jaskie (Motorola Inc.), *Covalently Bonded Disordered Thin-Film Materials* (ISBN: 1-55899-403-3) documents symposium proceedings from the 1997 MRS Fall Meeting in Boston, MA, and contains 44 papers, 310 pages. Volume 498 in the MRS Symposium Proceedings Series, it is available in hardcover or microfiche for \$60.00 (MRS members), \$68.00 (US list), and \$79.00 (Non-US list).

New Volume from MRS Focuses on High-Performance Ceramic Materials in Electronics

Just published by MRS, *Chemical Aspects of Electronic Ceramic Processing* documents symposium reports from the 1997 Fall Meeting in Boston, MA, and contains 65 papers, 469 pages.

The use of high-performance ceramic materials in electronics holds the potential for the development of a wide array of novel, high-value products. These include: ferroelectric ceramic capacitors for ferroelectric nonvolatile random access memory (FRAM); high-dielectric capacitors for dynamic random access memory (DRAM); low-dielectric aerogels and mesoporous materials; electrooptical materials for waveguides, filters, and switches; electronic packaging and interconnects for microelectronics; and wide-bandgap materials for blue LEDs and high-temperature devices. The key to the application of any of these materials is the method of deposition (thin films) or fabrication (bulk). As in prior years, chemical vapor deposition (CVD) continues to be a popular area of research and is the subject

MRS PUBLICATIONS

of at least half of the papers in this volume. Particularly "hot" areas of research are new and improved precursors, delivery systems for low-vapor pressure precursors, and improved processing and materials properties. Papers are evenly divided between oxide ceramics and nonoxide ceramics. Solution processing of films is also a central theme. Using several techniques and chemistries, a wide range of materials are deposited with excellent properties. This technique holds the promise of replacing many expensive high-vacuum techniques with simpler and cheaper solution chemistry ceramics. Topics include: chemical vapor deposition of oxide ceramics; chemical vapor deposition of nonoxide ceramics; solution routes to ceramic materials; characterization and application of ceramic materials; and novel processing of ceramic materials—process characterization.

Edited by P.N. Kumta (Carnegie Mellon University), A.F. Hepp (NASA Lewis Research Center), D.B. Beach (Oak Ridge National Laboratory), B. Arkles (Gelest, Inc.), and J.J. Sullivan (MKS Instruments, Inc.), *Chemical Aspects of Electronic Ceramic Processing* (ISBN: 1-55899-400-9) is Volume 495 in the MRS Symposium Proceedings Series, and is available in hardcover or microfiche for \$62.00 (MRS members), \$71.00 (US list), and \$82.00 (Non-US list).

New Volume from MRS Examines Thin-Film Structures for Photovoltaics

Just published by MRS, *Thin-Film Structures for Photovoltaics* documents symposium reports from the 1997 MRS Fall Meeting in Boston, MA, and contains 49 papers, 312 pages.

Substantial progress has been demonstrated in developing thin-film-based II-VI, I-III-VI, and III-V semiconductors for photovoltaic (PV) devices. Success in these areas has also prompted research into thin (thickness $<20\mu\text{m}$) silicon solar cells. Thin-film PV devices require novel approaches to device design, deposition, and growth techniques, and large-area uniformity coupled with low-cost requirements. This volume addresses various issues in the design and fabrication of thin-film PV devices, deposition of semiconductors on low-cost substrates, nucleation and growth phenomena, interface and surface properties that influence film morphology and its structural, electrical, and optical properties. This volume also addresses process issues, such as individual layers during device fabrication. Topics include: silicon-based thin films; II-VI-based thin films, III-V-based thin films, and thin films—general.

Edited by Eric D. Jones (Sandia National Laboratories), Juris Kalejs (ASE Americas Inc.), and Rommel Noufi and Bhushan Sopori (National Renewable Energy Laboratories), *Thin-Film Structures for Photovoltaics* (ISBN: 1-55899-390-8) is Volume 485 in the MRS Symposium Proceedings Series, and is available in hardcover or microfiche for \$60.00 (MRS members), \$68.00 (US list), and \$79.00 (Non-US list).

To order, contact the Materials Research Society, Customer Services Department, 506 Keystone Drive, Warrendale, PA 15086, phone: +724-779-3003, fax: +724-779-8313

ASSESSING THE DEPTHS OF DEGRADATION

The National Physical Laboratory has published a technical report evaluating the degradation and fatigue properties of piezoelectric and magnetostrictive materials designed for continuous operation within demanding environments.

These materials are being developed as sensors and actuators for use under conditions of high electrical and mechanical stress, and high stress rate. Research programs, supported by the UK's Department of Trade and Industry and the European Commission, are developing techniques for quantifying the degradation of these materials under typical service conditions.

A variety of techniques, including acoustic, thermal, and optical imaging are being used to monitor degradation. The combination of adopting various complimentary methods allows better materials and products to be developed.

Further details on obtaining a copy of the report may be obtained from Markys Cain, National Physical Laboratory, Queens Road, Teddington TW11 0LW, United Kingdom, phone: +44- 181-943-6599, fax: +44-181-943-2989, e-mail: markys.cain@npl.co.uk

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The Dielectrics Society 29th Annual Conference & The 4th UK Transducer Materials and Transducers Workshop, Canterbury, England	6-9 Apr 98	No.1, p.18
16th Conference on Crystal Growth and Epitaxy, Fallen Leaf Lake, California, USA	7-10 Jun 98	No.1, p.19
IEEE Conference on Electrical Insulation and Dielectric Phenomena (CEIDP98), Atlanta, Georgia, USA	25-28 Oct 98	No.2, p.12
Processing of High Dielectric Constant Materials for DRAMs, 45 International Symposium of the American Vacuum Society, Session EM12, Baltimore, Maryland, USA	2-6 Nov 98	No.2, p.12
Micro System Technologies 98, 6th International Conference and Exhibition on Micro Electro, Opto, Mechanical Systems and Components, Potsdam, Germany	1-3 Dec 98	No.2, p.13
International Conference on Solid State Crystals Materials Science and Applications, Zakopane, Poland	12-16 Oct98	No.3, p.16
11th International Symposium on Integrated Ferroelectrics (ISIF99), Colorado Springs, Colorado, USA	7-10 Mar 99	No.3, p.16
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9th European Meeting on Ferroelectricity (EMF-9), Prague, Czech Republic	12-16 Jul 99	No.3, p.18
11th American Conference on Crystal Growth and Epitaxy, Tucson, Arizona, USA	1-6 Aug 99	No.3, p.19
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Mar 7-10	• 11th International Symposium on Integrated Ferroelectrics (ISIF '99), Colorado Springs, Colorado, USA (see <i>Ferroelectricity Newsletter</i> , Vol. 6, No. 3, p. 16)
May 26-29	• 16th Meeting on Ferroelectric Materials and Their Applications (FMA 16), Kyoto, Japan (see p. 35)
Jun 7-10	• Transducers '99: The 10th International Conference on Solid-State Sensors and Actuators, Sendai, Japan (see <i>Ferroelectricity Newsletter</i> , Vol. 6, No. 3, p.17)
Jun 24-26	• 3rd Korea-Japan Conference on Ferroelectrics, Kyungju, Korea (see p. 35)
Jul 12-16	• 9th European Meeting on Ferroelectricity (EMF-9), Prague, Czech Republic (see <i>Ferroelectricity Newsletter</i> , Vol. 6, No. 3, p. 18)
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Aug 1-6	• 11th American Conference on Crystal Growth and Epitaxy, Tucson, Arizona, USA (see <i>Ferroelectricity Newsletter</i> , Vol. 6, No. 3, p. 19)
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