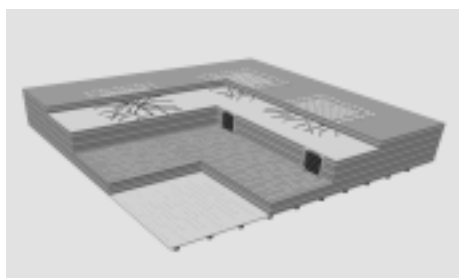


IMAPS Conference and Exhibition on Ceramic Interconnect Technology: The Next Generation

HYATT REGENCY DENVER
DENVER, CO
APRIL 26 - 28, 2004



GENERAL CHAIR:

Dr. Samuel J. Horowitz
*DuPont Electronic and Communications
Technology*
P: 919-248-5752
samuel.j.horowitz@usa.dupont.com

TECHNICAL PROGRAM CO-CHAIRS:

Michael Ehlert
National Semiconductor
P: 949-380-2010
michael.ehlert@nsc.com

Dr. Duane Dimos
Sandia National Laboratory
P: 505-844-6385
dbdimos@sandia.gov

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&

CERAMIC INTERCONNECT INITIATIVE (CII)

ENDORSED BY:

THE AMERICAN CERAMICS SOCIETY (ACERS)



The
American
Ceramic
Society



SESSION OUTLINE

Session TA1: Portable Wireless and Bluetooth
Chair: Fred Barlow, University of Arkansas

Session TA2: Automotive Applications
Chair: Adam Schubring, Visteon

Session TP1: Broad Band & Base Stations
Chair: Martin Oppermann, EADS Deutschland GmbH

Session TP2: Advanced Assembly Topics
Chair: Paul Collander, Poltronic

Session TP3: Power and Thermal Management
Chair: Alan Lyons, Lucent

Session TP4: Design Simulation and Modeling
Chair: John Gipprich, Northrop Grumman Corporation

Session TP5: Advanced Topic – Poster Session
Chair: Samuel J. Horowitz, DuPont Electronic and Communications Technology

Session WA1: MEMS
Chair: Jonathan Custer, Sandia National Laboratories

Session WA2: Integrated Passives in LTCC
Chair: Raghu Settalur, Oregon State University

Session WA3: Materials Integration
Chair: Daniel Amey, DuPont Microcircuit Materials

Session WA4: Challenges in Integrated Passives
Chair: Duane Dimos, Sandia National Laboratory

Session WP1: New Materials
Chair: Michael Lanagan, The Pennsylvania State University

Session WP2: Test and Measurement
Chair: Michael Janezic, National Institute of Standards and Technology (NIST)

Session WP3: LTCC Systems & Processing
Chair: Larry Zawicki, Kansas City Plant

Session WP4: Process Modeling
Chair: Veena Tikare, Sandia National Laboratories

**SAVE \$50 ON THE TECHNICAL PROGRAM REGISTRATION
WHEN YOU REGISTER ON-LINE AT: WWW.IMAPS.ORG/CERAMICS**

Early Registration and Hotel Deadline: March 26, 2004

Message from the General Chair

The 2004 Conference on Ceramic Interconnect Technology has evolved from very successful workshops in 2001 and 2002 and a similarly successful conference in 2003. In the earlier workshops the focus was primarily on wireless and microwave applications. For 2004 the meeting will continue as a conference with two parallel tracks with 54 papers and posters. The two-track and poster session format provides an opportunity to cover a broad range of topics and includes sessions on Automotive Applications, Assembly, MEMS, Advanced Topics and Process Modeling

This conference has an outstanding program and roster of speakers. I would like to thank the Technical Program Co-chairs (Mike Ehlert and Duane Dimos) and all of the Session Chairs, whom you see listed in the program, for the outstanding job they have done to create this meeting. All are volunteers with busy schedules, yet they found time to recruit this group of leading industry experts as presenters. Thanks to each of you for a job well done.

I am very pleased that IMAPS and the Ceramic Interconnect Initiative, which continue as sponsors for this conference, are again collaborating with the American Ceramic Society for the 2004 meeting. Duane Dimos continues as a Technical Program Co-chair providing a strong link to Ceramic Society members. By combining the broad scope represented by IMAPS, CII and ACerS membership we have organized a key meeting covering emerging developments in growth markets

LTCC and packaging applications in automotive and portable wireless have in recent years been the growth engine for ceramic interconnect technology. This is the present, whereas some suggest the future is in non packaging applications. The selection of invited keynote speakers reflects these trends.

This year's conference features two invited keynote speakers. First an overview from Kevin Ewsuk of Sandia National Laboratory, "Materials and Process Control Technology for LTCC Microelectronic Packaging" which will focus on how key issues related to materials compatibility and process control and reproducibility are being addressed. The second invited keynote presentation will be by Professor Jorge Santiago-Aviles of the University of Pennsylvania, the title of which is "Sensors, Actuators and other Non Packaging Applications of LTCC Tapes". This paper looks at microfluidic applications and process for fabricating complex 3-D structures.

With a focus on applications, new materials and process, the 2004 conference includes sessions on Portable Wireless and Bluetooth, Automotive Applications, Broadband and Basestations Assembly, Power and Thermal Management, Design Simulation and Modeling, MEMS, Integrated Passives, Test and Measurement and Process Modeling. We will again see examples of the trend from simple interconnect to integrated devices incorporating embedded components to a future where the full potential of ceramic multilayer structures is realized by the miniaturization and integration of a broad range of functions.

Finally, we are again including a limited number of tabletop exhibits to provide the opportunity for those involved in development and manufacturing to meet suppliers who support our industry. Tabletop exhibits will, as last year, be located in the same room used for breaks and meals to allow easy networking. To reserve a space, visit www.imaps.org/ceramics or contact Doug Paul (dpaul@imaps.org), 202-548-8712. Space is extremely limited, so reserve yours as soon as possible.

The 2004 Conference on Ceramic Interconnect Technology has all of the ingredients for a successful meeting; please join us in Denver on April 26-28.

Samuel J. Horowitz
General Chair

Tabletop Exhibition

"An opportunity to talk to industry leaders"

April 27 - 28, 2004

Only tabletop exhibits will be accepted.
Free standing exhibits will not be allowed at this event.

Tuesday - April 27 10 am - 6:30 pm (Exhibit Hours)

Lunch, Refreshment Breaks and a Reception/Buffer Dinner will be held in the Exhibit Hall.

Wednesday - April 28 10 am - 2 pm (Exhibit Hours)

Lunch & Refreshment Breaks will be in the Exhibit Hall.

For more information visit www.imaps.org/ceramics or contact:
Doug Paul, dpaul@imaps.org; 202-548-8712

NEW Feature Available for Exhibitors

IMAPS will provide all exhibitors an opportunity to provide up to six (6) pages of company products, services and contact information to be included on the post-event Technical Presentations CD-ROM. These CD-ROMs are provided to all technical conference attendees and are for sale through IMAPS to all industry professionals.

This new and unique feature will promote the Exhibitor's products and abilities much longer than just the Conference. There is a charge of \$50 for this optional feature. This equates to 6 pages of advertising for just \$50.

These submissions must be no more than six (6) pages long and must be sent, electronically, in Word or PDF format, to dpaul@imaps.org no later than April 16, 2004.

Technical Conference Registration

Your registration fee includes all Technical Sessions, Luncheons, Refreshment Breaks, Receptions, Dinners and a Proceedings (Book and CD).

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Conference Proceedings

If you are unable to attend the Conference and would like a copy of the Proceedings, you may purchase a copy by using the registration form. Your copy will be mailed to you after the event.

The cost is \$100 for members; \$175 for non-members,* plus shipping and handling. Reserve your copy on-line at www.imaps.org/ceramics or call 202-548-4001.

*includes 1 year IMAPS membership at no charge

Conference Hotel

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1750 WELTON STREET
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PHONE: 800-223-1234; 303-295-5860

SINGLE/DOUBLE.....\$179

Monday, April 26

REGISTRATION: 5 PM - 7:30 PM

OPENING RECEPTION: 6:30 PM – 7:30 PM

Tuesday, April 27

REGISTRATION: 7 AM - 6:30 PM

EXHIBIT HOURS: 10 AM - 6:30 PM

OPENING REMARKS: 8:15 AM - 8:30 AM

DR. SAMUEL HOROWITZ, MIKE EHLERT AND DR. DUANE DIMOS, CONFERENCE CHAIRS

KEYNOTE PRESENTATIONS

8:30 am - 10 am

TITLE: MATERIALS AND PROCESS CONTROL TECHNOLOGY FOR LTCC MICROELECTRONIC PACKAGING

SPEAKERS: KEVIN G. EWSUK, CHRISTOPHER B. DIANTONIO, FERNANDO URIBE, SAUNDRA L. MONROE,
SANDIA NATIONAL LABORATORIES

TITLE: SENSORS, ACTUATORS AND OTHER NON-PACKAGING APPLICATIONS OF LTCC TAPES

SPEAKERS: JORGE J. SANTIAGO-AVILÉS, UNIVERSITY OF PENNSYLVANIA; MARIO GONGORA-RUBIO, IPT;
PATRICIO ESPINOZA-VALLEJOS, AGERE; L. SOLA-LAGUNA, DUPONT ELECTRONIC MATERIALS

BREAK: 10 AM – 10:30 AM

SESSION TA1

PORTABLE WIRELESS AND BLUETOOTH

10:30 am - Noon

CHAIR: FRED BARLOW, UNIVERSITY OF ARKANSAS

LTCC BASED FRONT-END RECEIVER FOR 5 GHz WLAN APPLICATIONS

Minh Van, Fred Barlow, Victor Wang, Aicha Elshabini, University of Arkansas

MICROSYSTEM INTEGRATION WITH NEW TECHNIQUES IN LTCC

Ken A. Peterson, Steve B. Rohde, Charles A. Walker, Timothy S. Turner, Sandia National Laboratories

DESIGN OF LTCC DEVICES FOR WLAN (802.11A/B/G)

Wen-Teng Lo, Jau-Ho Jean, Advanced Ceramic X (ACX) Corp.

SESSION TA2

AUTOMOTIVE APPLICATIONS

10:30 am - Noon

CHAIR: ADAM SCHUBRING, VISTEON

LTCC TECHNOLOGY FOR HIGH VOLUME AND LOW COST PRODUCTION OF AUTOMOTIVE CIRCUITS

Nicolas Gosselin, Jean-Pierre Cazenave, Magali Renoult, Jacky Cerisier, DT Microcircuits

UTILIZING AN LTCC SUBSTRATE IN AN UNDER-HOOD ENGINE CONTROL APPLICATION

M. Ray Fairchild, David W. Zimmerman, Kevin W. Brunner, Carl W. Berlin, Delphi Corp.

MEETING ENVIRONMENTAL CHALLENGES FOR ADVANCED AUTOMOTIVE MECHATRONIC APPLICATIONS

James R. Thompson, Mark C. Christopher, Chrysler Corp.; John L. Evans, Auburn University

LUNCH: NOON – 1 PM

SESSION TP1
BROAD BAND & BASE STATIONS

1 pm - 2:30 pm

CHAIR: MARTIN OPPERMANN, EADS DEUTSCHLAND GMBH

A HIGHLY SELECTIVE, DOUBLE-DIELECTRIC E-PLANE BANDPASS FILTER FOR MILLIMETER-WAVE APPLICATIONS
Raghu K. Settaluri, Oregon State University

A COMPACT RF MODULE FOR ACTIVE PHASED ARRAY ANTENNA USING LTCC PACKAGE WITH EMBEDDED PASSIVE COMPONENTS
Hideyuki Oh-hashii, Tetsu Owada, Morishige Hieda, Kazuhisa Yamauchi, Youji Yamanaka, Kazuhiko Nishida, Hiroshi Ikematsu, Youichi Kitamura, Mitsubishi Electric Corporation

BROADBAND HIGH FREQUENCY PACKAGE DESIGN USING CLOSED AIR-FILLED SEALED CAVITIES

Jerry Aguirre, Paul Garland, Adele Karmouche, Derek Mrazek, Joseph Tallo, Kyocera America Inc.

SESSION TP2
ADVANCED ASSEMBLY TOPICS

1 pm - 2:30 pm

CHAIR: PAUL COLLANDER, POLTRONIC

A COMPARATIVE STUDY OF CERAMIC AND ORGANIC SUBSTRATE TECHNOLOGIES FOR A HIGH PERFORMANCE FLIP CHIP PROCESSOR APPLICATION

Linda Bal, Andrew Mawer, Thomas Koschmieder, Motorola

APPLICABILITY OF ACTIVE SOLDER JOINING TECHNOLOGY TO LTCC PACKAGING

Ronald W. Smith, Randall Redd, S-Bond Technologies LLC

IMPROVEMENTS IN THE THERMAL-CYCLED ADHESION OF SOLDERED CONDUCTORS ON LTCC SUBSTRATES

Patricia J. Ollivier, Yueli Wang, Christopher R. Needes, DuPont Microcircuit Materials

BREAK: 2:30 PM - 3 PM

SESSION TP3
POWER AND THERMAL MANAGEMENT

3 pm - 4:30 pm

CHAIR: ALAN LYONS, LUCENT

PRECISION ALIGNMENT AND COOLING STRUCTURES FOR PHOTONIC PACKAGING ON LTCC

Kari Kautio, Kimmo Keränen, Pentti Karioja, VTT Electronics

A MICROJET ARRAY AIR IMPINGEMENT COOLING PACKAGE FABRICATED USING LOW TEMPERATURE CO-FIRED CERAMIC
Kuldeep Saxena, Fred Barlow, Victor Wang, Simon Ang, Aicha Elshabini, University of Arkansas

THERMAL PERFORMANCE OF 943 LOW LOSS GREEN TAPE™ LTCC WITH THERMAL VIA AND INTERNAL METALLIZATION ENHANCEMENTS

Daniel I. Amey, DuPont Microcircuit Materials; MiMi Keating, DuPont Central Research & Development

SESSION TP4
DESIGN SIMULATION AND MODELING

3 pm - 5 pm

CHAIR: JOHN GIPPRICH, NORTHROP GRUMMAN CORPORATION

SIMULATION AND MODELING TECHNIQUES FOR COMPACT LTCC PACKAGES

Ted Mirraco, Lloyd Nakamura, Malcolm Edwards, Applied Wave Research

DESIGN AND VERIFICATION OF EMBEDDED PASSIVE CIRCUITS IN LTCC SUBSTRATES FOR HIGH PERFORMANCE, LOW COST RF SiP MODULES

W. R. Smith, Matthew Hoppe, Ditrans Corporation

A DESIGN METHODOLOGY FOR EMBEDDED FILTERS

Cheri A. Anaclerio, Northrop Grumman Corp.

NEW TOROIDAL INDUCTOR CONFIGURATIONS FOR LTCC APPLICATIONS

Michael Phillips, Raghu K. Settaluri, Oregon State University

RECEPTION: 5:30 PM - 6:30 PM

SESSION TP5
ADVANCED TOPIC - POSTER SESSION

5:30 pm - 6:30 pm

CHAIR: SAMUEL J. HOROWITZ, DUPONT ELECTRONIC AND COMMUNICATIONS TECHNOLOGY

HIGH ENERGY DENSITY PLZT THIN FILM CAPACITORS

Bruce A. Tuttle, David Williams, Mark Rodriguez, Thomas Headley, Sandia National Laboratories

LOW TEMPERATURE & PRESSURE LAMINATION OF LTCC TAPES FOR MESO-SYSTEMS

Mário R. Gongora-Rubio, IPT Instituto de Pesquisas Tecnológicas; Núria Ibañez Garcia, Universidad Autónoma de Barcelona; Zaira Mendes Rocha, Andréa de Oliveira, Universidade de São Paulo

A CERAMIC SEALED CAVITY WITH SCREEN PRINTED CERAMIC DIAPHRAGM

Clayton B. Sippola, CMC Electronics Cincinnati; Chong Ahn, University of Cincinnati

A COMPACT ULTRASONIC TRANSDUCER USING THE ACTIVE PIEZOCERAMIC MATERIAL AS ELECTRONICS CARRIER

Jonny Johansson, Jerker Delsing, Lulea University of Technology

DEPLOYED ION MOBILITY SPECTROMETER AND MICRO-NOZZLES FABRICATED IN LTCC MATERIALS
Donald Plumlee, Amy Moll, Boise State University; Judi Steciak, University of Idaho

MASKLESS MESOSCALE MATERIALS DEPOSITION (M3D) FOR METAL DEPOSITION ON CERAMIC SUBSTRATES
Bruce H. King, Optomec, Inc.

FINE LINE MANUFACTURING FOR LTCC BY USING PHOTOSENSITIVE MATERIALS
Aila Petajarvi, Kimmo Jokelainen, Kemi-Tornio Polytechnic

Wednesday, April 28

REGISTRATION: 7:30 AM - 5 PM

EXHIBIT HOURS: 10 AM - 2 PM

**SESSION WA1
MEMS**

8 am - 10 am

CHAIR: JONATHAN CUSTER, SANDIA NATIONAL LABORATORIES

MEMS AND CHIP-SCALE ATOMIC CLOCKS

Y.C. Lee, Victor M. Bright, Zoya Popovic, Yuan-jen.Chang, Simone Lee, Alexander Laws, Alan Brannon, Jason Breitbarth, University of Colorado

A MICROMACHINED CERAMIC VERTICAL LEAF SPRING ACTUATOR USING LTCC MATERIALS SYSTEM

Craig H. Newborn II, Jennifer M. English, The University of Alabama in Huntsville

ADVANCED SURFACE CHARACTERIZATION OF MEMS DEVICES: FROM RELEASE TO PACKAGING

James A. Ohlhausen, Kevin R. Zavadil, Diane E. Peebles, Steve M. Thornberg, Sandia National Laboratories

DEVELOPMENT OF MICROMOLDS AND APPLICATION WITH LTCC SUBSTRATES TO OBTAIN MICROFLUIDIC DEVICES

Roberto Castillo Colon, Eliphaz Wagner Simões, Rogerio Furlan, Roberto Eduardo Bruzetti Leminski, Mário Ricardo Gongora-Rubioc, University of Puerto Rico at Humacao; Jorge J. Santiago-Aviles, University of Pennsylvania

SESSION WA2

INTEGRATED PASSIVES IN LTCC

8 am - 10 am

CHAIR: RAGHU SETTALURI, OREGON STATE UNIVERSITY

MULTI-LAYER CIRCUIT DESIGN WITH EMBEDDED PASSIVES

Sheng Mou Lin, Li-Qun Yang, Hong-Yang Chang, Shyh-Ting Fang, Industrial Technology Research Institute

PERFORMANCE OF BURIED AND SURFACE RESISTORS IN 943 LTCC LOW LOSS SYSTEM

Mike F. Barker, Daniel I. Amey, Kenneth E. Souders, Latasha Y. Joyner, Timothy P. Mobley, DuPont Microcircuit Materials

GLASS PHASE IMMISCIBILITY OF THICK-FILM RESISTORS EMBEDDED IN LOW TEMPERATURE CO-FIREABLE CERAMIC SUBSTRATES

Chi-Shiung Hsi, Fang-Min Shieh, Hua-Pin Chen, I-Shou University

RF RESPONSE OF DUPONT 943 AND FERRO A6 FROM 2.7 TO 14.2 GHz

Howard A. Morgenstern, Honeywell Federal Manufacturing & Technology

BREAK: 10 AM - 10:30 AM

**SESSION WA3
MATERIALS INTEGRATION**

10:30 am - Noon

CHAIR: DANIEL AMEY, DUPONT MICROCIRCUIT MATERIALS

COMPARATIVE METHODS FOR ACHIEVING FINE LINE FEATURES

Daniel C. Hughes, Hybrid Screen Technologies, Inc.; Randy Klein-Heraeus, Inc.

INCORPORATION OF THICK FILM MULTILAYER DIELECTRIC AND RESISTOR ONTO THIN FILM COPPER METALLIZATION

David Lin, Taichaun Ding, Ford Wei, Tong Hsing Electronics; Ray Petit, Pacific Rim Technology

HIGH DIELECTRIC CONSTANT MATERIALS FOR LOW TEMPERATURE CO-FIRED CERAMICS

Michael T. Lanagan, Ching-Tai Cheng, Tom Shrout, Elena Semouchkina, Clive Randall, The Pennsylvania State University

SESSION WA4

CHALLENGES IN INTEGRATED PASSIVES

10:30 am - Noon

CHAIR: DUANE DIMOS, SANDIA NATIONAL LABORATORY

LOW-TEMPERATURE CO-FIRED NiZnCu FERRITES AND HIGH-K DIELECTRICS FOR INTEGRATED PASSIVES

Hyo Tae Kim, Joong-Hee Nam, Korea Institute of Science & Tech. (KICET); Michael T. Lanagan, Thomas Shrout, The Pennsylvania State University

INVESTIGATION OF LTCC RESISTORS DURING FIRING AND SUBSEQUENT RE-FIRINGS

Michail Moroz, Ferro Electronic Material Systems

PROTOTYPING CHALLENGES USING LOW TEMPERATURE COFIRED CERAMIC MATERIALS

Amanda Baker, Elena Semouchkina, George Semouchkin, Jaun Nino, Takaki Murata, Michael Lanagan, Clive Randall, The Pennsylvania State University

LUNCH: NOON - 1 PM

**SESSION WP1
NEW MATERIALS**

1 pm - 2:30 pm

CHAIR: MICHAEL LANAGAN, THE PENNSYLVANIA STATE UNIVERSITY

INVESTIGATION OF NANO OXIDE CRYSTALLITES IN INTERNAL ELECTRODES FOR MULTILAYER CERAMIC CIRCUITS
Chi-Jen Shih, Industrial Technology Research Institute

INTEGRATED HIGH ZIRCONIA CONTENT PLZT DIELECTRICS FOR HIGH ENERGY PULSE DISCHARGE APPLICATIONS
David Williams, Bruce A. Tuttle, Paul G. Clem, Sandia National Laboratories

NOVEL LTCC REACTION BONDED HEXAFERRITES FOR MM - WAVE APPLICATIONS
Oliver Dernovsek, R. Karmazin, N. Ilkov, R. Matz, S. Walter, W. Wersing, M. Hagymasi, A. Roosen, W. Haas, SIEMENS AG

**SESSION WP2
TEST AND MEASUREMENT**

1 pm - 2:30 pm

CHAIR: MICHAEL JANEZIC, NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY (NIST)

CHARACTERIZATION OF LOW-LOSS DIELECTRIC MATERIALS USING A NOVEL RUTILE DIELECTRIC RESONATOR TECHNIQUE
Paul A. Smith, J. E. Holmes, T. W. Button, University of Birmingham

DESIGN CONSIDERATIONS FOR UNIPLANAR TEST STRUCTURES FOR HIGH FREQUENCY MATERIAL CHARACTERIZATION
Daniel I. Amey, Tim P. Mobley, DuPont Microcircuit Materials; Ethan Miller, Can Akgun, Rhonda Franklin Drayton, University of Minnesota

OVERVIEW OF MILLIMETER WAVE DIELECTRIC MEASUREMENT TECHNIQUES
Michael Janezic, National Institute of Standards and Technology (NIST)

BREAK: 2:30 PM - 3 PM

**SESSION WP3
LTCC SYSTEMS & PROCESSING**

3 pm - 5 pm

CHAIR: LARRY ZAWICKI, KANSAS CITY PLANT

NEW Pb FREE LTCC SYSTEM FOR AUTOMOTIVE AND TELECOMMUNICATION APPLICATIONS
Yong S. Cho, Kenneth W. Hang, Mike F. Barker, Patricia J. Ollivier, Carl B. Wang, Daniel I. Amey, Kenneth Souders, Christopher R. Needes, DuPont Electronic Technologies

LTCC MATERIAL SYSTEM AND ITS APPLICATION FOR AUTOMOTIVE ECU
Susumu Nishigaki, Ulrich Goebel, Walter Roethlingshoefer, Robert Bosch GmbH

THE ROLE OF THE ADHESIVE RHEOLOGY ON THE COLD LOW PRESSURE LAMINATION OF GREEN CERAMIC TAPES
D. Couto, L. Schwegler, Robert Bosch GmbH; A. Roosen, University of Erlangen-Nuremberg

CONSTRAINED SINTERING OF LTCC
Jau-Ho Jean, Jui-Chuan Chang, Cheng-Dao Lei, Chiao-Chan Huang, National Tsing Hua University

**SESSION WP4
PROCESS MODELING**

3 pm - 5 pm

CHAIR: VEENA TIKARE, SANDIA NATIONAL LABORATORIES

MICROSTRUCTURAL SIMULATION OF SOLID STATE SINTERING
Michael Braginsky, Veena Tikare, Sandia National Laboratories

MICROMECHANICAL BEHAVIOR OF COHESIVE PARTICLE NETWORKS
Kelly T. Miller, Sarunya Promkotra, Graham Mustoe, Colorado School of Mines

CHARACTERIZATION OF THE SHRINKAGE BEHAVIOR OF PURE, SCREEN PRINTED THICK FILM PASTES AND LTCC GREEN TAPES
Andreas Roosen, Dirk Pohle, Matthias Wagner, University of Erlangen - Nuremberg

HYBRID THICK-FILM DIMMING BALLASTS FOR FLUORESCENT LAMPS
Janusz J. Gondek, Slawomir Kordowiak, Wojciech Mysinski, J. Kocol, Private Institute of Electronic Engineering

CONCLUDING REMARKS: 5 PM - 5:15 PM

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TECHNICAL PROGRAM

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- | | | |
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| <input type="checkbox"/> IMAPS/ACerS Member | \$515 | \$615 |
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| <input type="checkbox"/> Add to Ship in the US | \$7 | \$7 |
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(On or before 2/6) (After 2/6)

- | | | |
|--|-------|-------|
| <input type="checkbox"/> IMAPS/ACerS Member (Corporate/Org.) | \$450 | \$550 |
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Housing Accommodations **must** be made directly to:

Hyatt Regency Denver
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Phone: 800-223-1234; 303-295-5860

When making reservation, please reference Ceramic Interconnect
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Single/Double \$179

The Hyatt Regency requires a deposit for the first night's room and tax to hold your room. Deposit refunded if reservation is cancelled fourteen (14) days prior to arrival. After which time, deposit is non-refundable.

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Tabletop Exhibits: \$ _____
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