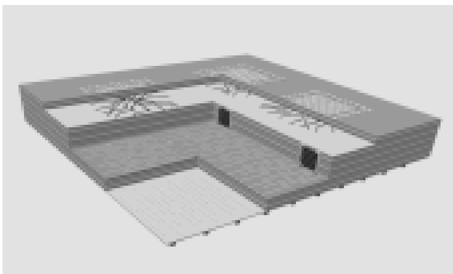
ADVANCE PROGRAM AND REGISTRATION

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

THE WESTIN HOTEL
DENVER, CO
APRIL 7-9, 2003



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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INTERNATIONAL MICROELECTRONICS AND PACKAGING SOCIETY **(IMAPS)**
&
CERAMIC INTERCONNECT INITIATIVE **(CII)**

ENDORSED BY:
THE AMERICAN CERAMICS SOCIETY **(ACERS)**

SESSION OUTLINE

SESSION TA1: PORTABLE WIRELESS AND BLUETOOTH APPLICATIONS
Chair: Fred Barlow, University of Arkansas

SESSION TA2: ASSEMBLY
Chair: Paul Collander, Nokia Networks

SESSION TP1: FIBER OPTIC APPLICATIONS
Chair: Alan Lyons, Lucent Corporation

SESSION TP2: AUTOMOTIVE APPLICATIONS
Chairs: D. H. R. Sarma & Carl Berlin, Delphi-Delco Electronics Systems

SESSION TP3: BROADBAND & BASE STATION APPLICATIONS
Chairs: Jens Mueller, Micro Systems Engineering GmbH & Co.;
George Passiopoulos, Nokia Networks

SESSION TP4: TEST AND MEASUREMENT
Chair: Mike Janezic, NIST

SESSION WA1: MATERIALS
Chair: Daniel Amey, DuPont Electronic Technologies

SESSION WA2: DESIGN SIMULATION AND MODELING
Chair: John Gipprich, Northrop Grumman Corporation

SESSION WA3: LTCC
Chair: Michael Lanagan, The Pennsylvania State University

SESSION WA4: INTEGRATED PASSIVES
Chair: William Borland, DuPont Electronic Technologies

SESSION WP1: POWER AND THERMAL MANAGEMENT
Chair: W. Kinzy Jones, Florida International University

SESSION WP2: MEMS
Chair: Robert Poole, Sandia National Laboratories

SESSION WP3: NOVEL APPLICATIONS
Chair: Steve Dai, Motorola

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

Early Registration and Hotel Deadline: March 7, 2003

Message from the General Chair

The 2003 Conference on Ceramic Interconnect Technology: The Next Generation has evolved from very successful workshops in 2001 and 2002. In these earlier workshops the focus was primarily on wireless and microwave applications. For 2003 the meeting will grow from a workshop into a conference with two parallel tracks and approximately 50 papers, doubling the number of sessions and presentations. The two-track format provides an opportunity to cover a broader range of topics and for 2003 includes sessions on Automotive Applications, Assembly, MEMS and Novel Applications.

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 full schedules, yet they found time to make telephone calls and send out emails 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 collaborating with the American Ceramic Society for the 2003 meeting. Duane Dimos joined as a Technical Program Co-chair to encourage greater involvement from Ceramic Society members. The program you see below reflects his efforts. A successful collaboration in 2003 will lead to a broader collaboration in future years. We thus have the possibility of a jointly sponsored conference in 2004 becoming the key industry meeting for ceramic interconnect and ceramic microsystems technologies sponsored by the leading professional and technical organizations focusing on ceramic technology.

LTCC and applications in automotive and portable wireless have in recent years been the growth engine for ceramic interconnect technology. The 2003 conference will include invited keynote presentations covering these key areas. First an overview from Bosch, who has been the global leader in applying LTCC technology to automotive applications followed by a review of integrated passive solutions in LTCC, enabling technology for many portable wireless applications, from the Technical University of Ilmenau. Sessions on Automotive and Integrated Passives cover these topics in greater depth. The continued importance of LTCC materials and processing are reflected in sessions on Portable Wireless and Bluetooth, Broadband, Materials, Design, Test and Measurement and Thermal Management.

The sessions on MEMS and Novel Applications provide a forum for the increased research and development focus on ceramic technology in innovative sensor, microfluidic and photonic applications. This is a logical extension of the trend from simple interconnect, to integrated devices incorporating embedded components in multilayer ceramic structures to a future where the full potential of ceramic multilayer structures is realized by the miniaturization and integration of a broad range of functions. These functions could include combinations of electronics, microfluidics, microreactors, microsensors and photonics.

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 2003 Conference on Ceramic Interconnect Technology has all of the ingredients for a successful meeting; please join us in Denver on April 7-9.

Samuel J. Horowitz
General Chair

Tabletop Exhibition

"An opportunity to talk to industry leaders"

April 8-9, 2003

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

Tuesday - April 8 **10 am - 7:30 pm (Exhibit Hours)**
Lunch, Refreshment Breaks and a Reception/Buffet Dinner will be held in the Exhibit Hall

Wednesday - April 9 **10 am - 4 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

Technical Conference Registration

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

Travel

FLY UNITED AND SAVE $$$

Take 5% off any United, United Express or Shuttle by United published fares, including First Class, in effect when tickets are purchased, subject to all applicable restrictions, or take 10% off applicable BUA, or like fares, in effect when tickets are purchased 7 days in advance. Reservations and schedule information may be obtained by calling the United Meetings desk at 1-800-521-4041 and referencing Meeting ID #583IW.

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; $160 for non-members,* plus shipping and handling. Reserve you copy on-line at www.imaps.org/ceramics or call 202-548-4001.

*includes 1 year IMAPS membership at no charge

Conference Hotel

THE WESTIN HOTEL
1672 LAWRENCE STREET
DENVER, CO 80202
TEL: 303-572-9100; FAX: 303-572-7288
HTTP://WWW.STARWOOD.COM/WESTIN/INDEX.HTML

SINGLE/DOUBLE........................$165

Monday, April 7

Registration Opens: 5 pm – 7:30 pm

Opening Reception: 6:30 pm – 7:30 pm

Tuesday, April 8

Registration: 6:45 am – 7:30 pm

Continental Breakfast: 7 am – 8 am

Exhibit Hours: 10 am – 7:30 pm

Opening Remarks: 8:15 am – 8:30 am

Dr. Samuel Horowitz, Mike Ehlert & Dr. Duane Dimos, Conference Chairs

Keynote Presentations

8:30 am - 10 am

Title: Innovative Applications with LTCC for Automotive ECU´s
Speakers: Walter Rothlinghofer & Ulrich Goebel, Robert Bosch GmbH

Title: Embedded Components and Functions in LTCC - Review and Prospect
Speakers: Heiko Thust, Torsten Thelemann, Waleed Ehrhardt, Karl-Heinz Drüe, Technical University of Ilmenau; Jens Müller, MSE GmbH Berg

Break: 10 am – 10:30 am

Session TA1

Portable Wireless and Bluetooth Applications

10:30 am – 12:30 pm

Chair: Fred Barlow, University of Arkansas

Dual Mode Switch Duplexer Modules Packaged in LTCC with 3D FEM
Tosho Nishikawa, Toyo Corporation; Harufumi Mandai, Murata Mfg.Co., Ltd.

Development of High-Frequency Products for Manufacturing Using a System-in-Package Approach
Andrew Cervin-Lawry, Paul Woo, Sukhi Binapal, Lisa Woodward, Tom Bernacki, Atin Patel, Kamal Ali, Cristian Miortescu, Gennum Corporation

Design Considerations for Hybrid LTCC-RF-Filters
Jens Mueller, Micro Systems Engineering GmbH & Co.

LTCC Based Slow Wave Filters for Wireless and Handheld Products
Fred D. Barlow, F. Magableh, A. Elshabini, University of Arkansas

Session TA2

Assembly

10:30 am – 12:30 pm

Chair: Paul Collander, Nokia Networks

Interconnection Reliability Studies of Some Ceramic Components and the Introduction of the Results into MTBF Calculations
Olli Samela, Klas Andersson, Jussi Särkkä, Markku Tammenmaa, Nokia Networks

Thermomechanical Responses and Reliability of LTCC Solder Attachments for Wireless Applications
Chia-Yu Fu, Peter Vo, Motorola Labs.

Side-Fill Underfill for RF SAW Packaging
Michael Chang, Brian Lu, Ken Wu, Tong Hsing Electronic Industries, Ltd.

Overmolded LTCC RF Modules
Jicheng “Jeff” Yang, Robert Darveaux, Adrian Federigan, Tony Arellano, Amkor Technology

Lunch: 12:30 pm – 1:30 pm

Session TP1
Fiber Optic Applications
1:30 pm – 3:30 pm

Chair: Alan Lyons, Lucent Corporation

Ultra Wide Frequency Band Ceramic Package and Assembly Technology
Yoshio Tsukiyama, Masato Shiobara, Masaya Hashimoto, Sumitomo Metal Industries Ltd.

Broadband Electrical Design and Modeling of Packages Integrated in LTCC-Substrates
Martin Nisznansky, Ch. Ziegler, L.-P. Schmidt, R. Hocke, O. Wohlgemuth, University of Erlangen

Telecom MEMS Packaging in Ceramics
David A. Ramsey, Nagesh R. Basavanhally, Yee L. Low, Lucent Technologies / Bell Laboratories

Session TP2
Automotive Applications
1:30 pm – 3:30 pm

Chairs: D. H. R. Sarma & Carl Berlin, Delphi-Delco Electronics Systems

Screen Printed Feature Size Capabilities
Daniel C. Hughes, Steve E. Ernster, Hybrid Screen Technologies, Inc.

A High Density Flip-Chip Interconnect Technology on Multilayer Ceramic Substrates for Automotive Controller Applications
Carl Berlin, D.H.R. Sarma, Wayne A. Sozansky, Delphi-Delco Electonics Systems

New Advancements in High Power Substrates for Automotive Applications
Keith Easler, Kyocera America Inc.

Break: 3 pm – 3:30 pm

Session TP3
Broadband & Base Station Applications
3:30 pm – 5:30 pm

Chairs: Jens Mueller, Micro Systems Engineering GmbH & Co.; George Passiopoulos, Nokia

Packaging and Interconnect for RF and Microwave
Paul Collander, Nokia Networks

Integrated Multilayer Modules using Multi-Mix® and Green Tape™ LTCC Materials
James Logothetis, Merrimac Industries, Inc.; Daniel I. Amey, Timothy P. Mobley, DuPont Microcircuit Materials

LTCC Technology for High Performance Low Power Base Station Applications
George Passiopoulos, Le Quang Dung, Kevin Lamacraft, Nokia Networks

Ceramic Triple-Mode Delay Filter for Cellular Base Station Applications
William Wilber, Weili Wang, William Engst, Ricardo Espina, Radio Frequency Systems

Session TP4
Test and Measurement
3:30 pm - 5:30 pm

Chair: Michael Janezic, NIST

The Measurement and Practical Significance of Complex Permittivity at mm-wave Frequencies
Charles E. Free, University of Surrey

Broadband Permittivity Measurements of Dielectric Substrates Using Planar Transmission Lines
Michael Janezic, Christopher Holloway, Dylan Williams, NIST

Four-Port On-Wafer Measurement of Coupled Transmission Lines on LTCC
Ch. Ziegler, M. Nisznansky, L.-P. Schmidt, R. Hocke, O. Wohlgemuth, Universitaet Erlangen-Nuernberg

Using Defect Information to Manage LTCC Yield and Manufacturing Costs
Benjamin Arnold, Midas Vision Systems

Reception: 6 pm – 6:30 pm

Dinner: 6:30 pm – 7:30 pm

Wednesday, April 9

Registration: 7 am – 5 pm

Continental Breakfast: 7 am – 8 am

Exhibit Hours: 10 am – 4 pm

Session WA1
Materials
8 am – 10 am
Chair: Daniel Amey, DuPont Electronic Technologies

Factors Affecting Characteristics of Thick Film Voltage Tunable Dielectric Materials
Marion Ed. Ellis, Fredrick Duvall, Barry Treadway, Shawn Tang, Elijah Underhill, Paratek Microwave

Dielectric Material and Waveguide Development for Low Temperature Co-fired Ceramics
Michael T. Lanagan, Chiping Wang, Sayed-Khaled Rajab, Clive Randall, Hsin-Cheng Chen, Kuen-Fwu Fuh, The Pennsylvania State University

Constrained Sintered LTCC Material Systems for Interconnects and Packages
Christopher R. Needes, Carl B.Wang, Michael F. Barker, Patricia T. Ollivier, Kenneth W. Hang, Yong Cho, Kenneth E. Souders, DuPont Company

Development of Integrated High Value Resistors on Novel Substrates
Bruce A. Tuttle, David P. Williams, Walter Olson, Paul Clem, Sandia National Laboratories; Bruce King, Michael Renn, Optomec, Inc.

Session WA2
Design Simulation and Modeling
8 am – 10 am
Chair: John Gipprich, Northrop Grumman Corporation

Compact Stacked Tandem Coupler in LTCC
Michael J. Lee, John W. Gipprich, Northrop Grumman Corporation

Design of Compact Multi-Level Via-Less Bandpass Filters with Higher Harmonic Suppression
Kala Gururajan, Raghu K. Settaluri, Oregon State University

Miniaturized High Performance Low-pass and Bandstop Filters for Wireless Applications
Harish Peddibhotla, Raghu K. Settaluri, Oregon State University

Design of Miniaturised RF Filters in LTCC
Sarmad Al-Taei, University College London; George Passiopoulos, Nokia Networks

Break: 10 am – 10:30 am

Session WA3
LTCC
10:30 am – 12:30 pm
Chair: Michael Lanagan, The Pennsylvania State University

Characterization and Control of Low Temperature Co-Fire Ceramic (LTCC) Sintering
Christopher B. DiAntonio, Kevin Ewsuk, Sandia National Laboratories

Trends in LTCC Processing
Dean Anderson, The Pennsylvania State University

The Co-sintering of LTCC Materials
Terry J. Garino, Sandia National Laboratories

A Model System for Interfacial Reactions in LTCC Materials
Lawrence Cook, Winnie Wong-Ng, Levin Levin, Peter Schenck, Mark Vaudin, Julia Suh, NIST

Session WA4
Integrated Passives
10:30 am – 12:30 pm
Chair: William Borland, DuPont Electronic Technologies

Manufacturability and Reliability of Trimmed Buried Resistors in LTCC
Waleed Ehrhardt, Heiko Thust, Technical University of Ilmenau; Jens Müller, Micro Systems Engineering GmbH & Co.

Dielectric and Magnetic Materials for Integrated Passives
Alvin H. Feingold, Merrill Heinz, Richard Wahlers, Electro-Science Labs, Inc.

High k LTCC System for High Frequency Applications
Yong S. Cho, Kenneth W. Hang, Carl B. Wang, Kenneth E. Souders, Diptarka Majumdar, Daniel Amey, Christopher R. Needes, DuPont

Performance of Low-Ohmic Co-Fired Buried Resistors in A6S Tape
Michail Moroz, Ferro Corporation

Lunch: 12:30 pm – 1:30 pm

Session WP1
Power and Thermal Management

1:30 pm – 3 pm

Chair: W. Kinzy Jones, Florida International University

Micro Heat Exchanger in LTCC Ceramic Substrates
Hari Adrulu, W. Kinzy Jones, Marc Zampino, Yanqiug Liu, Florida International University

LTCC Based MEMS Impingement Coolers
Fred D. Barlow, Kuldeep Saxena, Victor Wang, Simon Ang, Aicha Elshabini, University of Arkansas

Localized Chip Cooling using LTCC-Embedded Miniaturized Fluid Circuit
Michael Newton, Carol Gamlen, Brian Smith, Harris Corporation

Session WP2
MEMS

1:30 pm – 3 pm

Chair: Robert Poole, Sandia National Laboratories

Novel Structures in Ceramic Interconnect Technology
Ken A. Peterson, Steve Rohde, Tim Turner, Bob Stokes, Adrian Casias, Sandia National Laboratories

Ceramic Packaging for MEMS-Based Microsystems
Jonathan S. Custer, Sandia National Laboratories

Joining Small Components with Reactive Multilayer Foils
Timothy P. Weihs, Omar M. Knio, Reactive NanoTechnologies

Break: 3 pm – 3:30 pm

Session WP3
Novel Applications

3:30 pm – 5 pm

Chair: Steve Dai, Motorola

Ion Mobility Spectrometers fabricated in Low Temperature Co-Fired Ceramic Materials
Donald Plumlee, A.J. Moll, Boise State University; M. Tam, H. H. Hill, Washington State University - Chemistry Department

Ceramic-MEMS: Science and Technology
Rishi Raj, L.-A. Liew, University of Colorado

Microdischarge Arrays in Ceramics and Semiconductors: A New Family of Photonic Devices
J. Gary Eden, University of Illinois

Concluding Remarks: 5 pm – 5:15 pm

Registration Form

Register On-Line at www.imaps.org/ceramics and $ave $50

Ceramic Interconnect Conference - April 7-9, 2003

☐ Dr. ☐ Mr. ☐ Ms. IMAPS Member ID# ______________ ACerS Member ID# ______________

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Company/Affiliation____Job Position__________________________

Address____

City_________________________ State_____ Zip___________ Country__________________________________

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Registration Fees: Early Registration Ends 3/7/03

Technical Program

	(On or before 3/7)	(After 3/7)
☐ IMAPS/ACerS Member	$500	$600
☐ Non-member*	$575	$675

*Nonmember fee includes a 1 year IMAPS membership.

☐ Speaker/Chair	$350	$450

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Which Society are you a Member of?

☐ IMAPS Member
☐ ACerS Member
☐ Member of both IMAPS and ACerS
☐ Not a Member of either Society

Additional Purchases

☐ Spouse/Guest *(meals only)*	$150	$150
☐ Proceedings *(IMAPS/ACerS Member Rate)*	$100	$100
☐ Proceedings *(Non-Member Rate)*	$160	$160
☐ Book ☐ CD		
☐ Add to Ship in the US	$7	$7
☐ Add to Ship Overseas	$25	$25

Tabletop Exhibits (April 8 & 9)

☐ IMAPS/ACerS Member *(Corporate/Org.)*	$450	$550
☐ Non-member	$550	$650
☐ Yes, we will participate in the CD-ROM*	$50	$50

***Must be submitted electronically as a Word or PDF file to Brian Schieman (bschieman@imaps.org) no later than February 7, 2003.** Visit www.imaps.org/ceramics for detailed information.

Housing (Hotel Cut-off is March 7, 2003)

Housing Accommodations **must** be made directly to:

The Westin Hotel
1672 Lawrence Street
Denver, CO 80202
Phone: 303-572-9100; F: 303-572-7288
http://www.starwood.com/westin/index.html
When making reservation, please reference IMAPS.

Single/Double $165

The Westin Hotel 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.

Payment

Registration Fee: $__________________________

Additional Purchases: $__________________________

Tabletop Exhibits: $__________________________

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Mail this form with payment to: IMAPS * 611 2nd Street, NE * Washington, DC 20002-4909. For credit card transactions, register on-line: www.imaps.org; or register by phone with your credit card by calling 202-548-4001; Fax: 202-548-6115. Additional information? E-mail: IMAPS@imaps.org, or visit our web site: http://www.imaps.org. **Cancellations will be refunded (less a $50 processing fee) only if written notice is postmarked on or before March 21, 2003. No refunds will be issued after that date.**

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