International Conference on Compound Semiconductor Manufacturing Technology

May 16th – 19th, 2016
www.csmantech.org

Hyatt Regency Miami
Miami, Florida, USA
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Hotel photographs courtesy of Hyatt Regency Miami
CONFERENCE AT A GLANCE

SUNDAY, May 15th

6:00 PM – 8:00 PM REGISTRATION
Riverfront Lobby Central

7:00 PM – 10:00 PM JEDEC JC-14.7 MEETING
Hibiscus B

MONDAY, May 16th

7:30 AM – 7:00 PM REGISTRATION
Riverfront Lobby Central

7:30 AM – 8:30 AM CS MANTECH WORKSHOP BREAKFAST
Brickell

8:30 AM – 5:00 PM CS MANTECH WORKSHOPS
Flagler

7:30 AM – 8:30 AM ROCS REGISTRATION
Monroe Prefunction

7:30 AM – 8:15 AM ROCS BREAKFAST
Monroe

8:15 AM – 5:30 PM ROCS WORKSHOP
Monroe

12:00 PM – 1:30 PM LUNCHEON FOR WORKSHOPS
Brickell

6:00 PM – 9:00 PM EXHIBITS RECEPTION
Riverfront Hall

TUESDAY, May 17th

7:30 AM – 5:00 PM REGISTRATION
Riverfront Lobby Central

7:30 AM – 8:30 AM BREAKFAST
Riverfront Hall – Exhibits

8:30 AM – 9:00 AM OPENING CEREMONIES
Tuttle, Monroe, Flagler

9:00 AM – 5:20 PM EXHIBIT HOURS
Riverfront Hall

9:00 AM – 10:00 AM SESSION 1: PLENARY I
Tuttle, Monroe, Flagler

10:00 AM – 10:30 AM BREAK
Riverfront Hall - Exhibits
<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
</tr>
</thead>
</table>
| 10:30 AM – 12:00 PM | **SESSION 2: PLENARY II**  
Tuttle, Monroe, Flagler |
| 12:00 PM – 1:30 PM | **EXHIBITS LUNCH**  
Riverfront Hall |
| 1:30 PM – 2:50 PM | **SESSION 3: RF GaN DEVICES**  
Tuttle, Monroe, Flagler |
| 2:50 PM – 3:20 PM | **BREAK**  
Riverfront Hall – Exhibits |
| 3:20 PM – 4:40 PM | **SESSION 4: III-V DEVICES**  
Tuttle, Monroe, Flagler |
| 4:40 PM – 5:00 PM | **BREAK**  
Riverfront Hall – Exhibits |
| 5:00 PM – 6:30 PM | **EXHIBITORS' FORUMS**  
Brickell – Prefunction, South, Central, North |
| 5:00 PM – 6:30 PM | **STUDENT FORUM**  
Orchid C |
| 7:00 PM – 10:00 PM | **INTERNATIONAL RECEPTION** |

**WEDNESDAY, May 18th**

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
</tr>
</thead>
</table>
| 7:30 AM – 5:00 PM | **REGISTRATION**  
Riverfront Lobby Central |
| 7:30 AM – 8:30 AM | **BREAKFAST**  
Riverfront Hall – Exhibits |
| 8:30 AM – 9:50 AM | **SESSION 5a: TEST & CHARACTERIZATION**  
Flagler & Monroe |
| 8:30 AM – 9:50 AM | **SESSION 5b: MATERIALS & EPI**  
Tuttle |
| 8:30 AM – 11:00 AM | **EXHIBIT HOURS**  
Riverfront Hall |
| 9:50 AM – 10:20 AM | **BREAK**  
Riverfront Hall – Exhibits |
| 10:20 AM – 12:00 PM | **SESSION 6a: PROCESS – III-V TECHNOLOGY**  
Flagler & Monroe |
| 10:20 AM – 12:00 PM | **SESSION 6b: MANUFACTURING – DATA & AUTOMATION**  
Tuttle |
12:00 PM – 1:30 PM  OPEN  
Lunch at your own leisure or time explore Miami

1:30 PM – 3:10 PM  SESSION 7a: THERMAL MANAGEMENT 
Flagler & Monroe

1:30 PM – 3:10 PM  SESSION 7b: MANUFACTURING – DEFECTS & QUALITY 
Tuttle

3:10 PM – 3:40 PM  BREAK  
Upper & Lower Promenade

3:40 PM – 5:10 PM  SESSION 8a: HETEROGENEOUS INTEGRATION 
Flagler & Monroe

3:40 PM – 5:10 PM  SESSION 8b: POWER ELECTRONICS 
Tuttle

5:10 PM – 5:30 PM  RUMP SESSION RECEPTION 
Riverwalk Outdoor Terrace

5:30 PM – 6:30 PM  RUMP SESSIONS A-D 
Brickell – Prefunction, South, Center, North

7:00 PM – 9:00 PM  SEMI STANDARDS MEETING 
Orchid D

THURSDAY, May 19th

7:30 AM – 9:30 AM  REGISTRATION  
Riverfront Lobby Central

7:30 AM – 8:30 AM  BREAKFAST  
Jasmine

8:30 AM – 9:50 AM  SESSION 9: PROCESS - GaN  
Flagler & Monroe

9:50 AM –10:20 AM  BREAK  
Upper & Lower Promenade

10:20 AM –12:00 PM  SESSION 10a: PROCESS METALLIZATION 
Flagler & Monroe

10:20 AM –12:00 PM  SESSION 10b: RELIABILITY 
Tuttle
12:00 PM – 1:20 PM  CS MANTECH LUNCH
                Jasmine & Hibiscus

1:20 PM – 3:00 PM  SESSION 11: PROCESS - PASSIVATION
                Flagler & Monroe

3:10 PM – 4:00 PM  SESSION 12: POSTERS – OPTOELECTRONICS & EMERGING WIDE BANDGAP DEVICES
                Upper & Lower Promenade

4:10 PM – 4:40 PM  CLOSING RECEPTION
                Upper & Lower Promenade
MESSAGE FROM THE CONFERENCE CHAIR

In the age of more than Moore, the role of Compound Semiconductors is critical. CS ManTech is the forum dedicated to showcasing the latest in compound semiconductor processing, testing, design, and applications.

On behalf of the Executive and Technical Program Committees, I am pleased to welcome you to Miami, Florida, USA for the 31st annual International Conference on Compound Semiconductor Manufacturing Technology (CS ManTech). This year’s meeting at the Hyatt Regency Miami, May 16th – 19th, will bring together compound semiconductor professionals from around the world to share information, to exchange ideas, and to establish ties within the community. This is the annual event where the compound semiconductor industry comes together.

CS ManTech’s mission has always been to foster communication between industry, academia, and government. This mission is accomplished through a program composed of workshops, plenary and technical sessions, topical rump sessions, industry exhibits and exhibitor forum, along with several social functions to enable networking with peers. The CS ManTech Technical Program Committee has put together a great week of CS focused talks and social functions to engage attendees. Get out there and learn something!

Enjoy the conference!

Glen “David” Via
Conference Chair
2016 CS ManTech
2016 CONFERENCE SPONSORS

CS ManTech is an independent not-for-profit organization whose mission is to promote technical discussion and scientific education in the compound semiconductor manufacturing industry. The continued success of the conference is enabled by donations from corporate sponsors. The 2016 CS ManTech Conference Committee gratefully acknowledges the support from our sponsors.

(Sponsor list confirmed at press)

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We would again like to thank our 2015 sponsors!

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Microwave Journal
The 2016 CS ManTech program begins on Monday, May 16th with a series of tutorial workshops. This year’s workshop theme is III-V Device Manufacturing. Please see the MANTECH WORKSHOP section for details.

Also on Monday, CS ManTech is pleased to be hosting the internationally recognized Reliability of Compound Semiconductor (ROCS) workshop. This workshop is the premier forum for the presentation of the latest results and new developments related to compound semiconductor reliability. The JEDEC Committee JC-14.7 sponsors the ROCS workshop. Please see http://www.jedec.org/home/gaas for details.

On Monday evening the Exhibits open at 6:00 pm with the traditional Exhibits Reception. The CS ManTech exhibits are an excellent opportunity to view suppliers of materials, services, and tools from around the world. This is a great time to renew old relationships and establish new ones all while enjoying a refreshing drink and taste of Miami’s cuisine.

The CS ManTech Conference formally begins Tuesday morning with opening ceremonies that include the 2015 Best Paper awards, Sponsorship Recognition, and a conference overview along with a short tutorial on our new Mobile Application. Please see the MOBILE APP section for details. This is immediately followed by the two Plenary Sessions which will cover overviews of the future of 5G and how this affects the compound semiconductor industry.

For lunch we welcome our guests to the Exhibits Hall. Afterwards we’ll reconvene for the afternoon technical sessions where we will first hear about the latest RF GaN devices, followed by a session devoted to III-V device improvements through processing. These serial sessions are composed of invited and regular submission talks.

The Tuesday technical session will conclude with both the Exhibitors’ Forum and Student Forum. The Exhibitors’ Forum provides an opportunity for exhibitors to present short marketing/technical presentations to the conference attendees. The Student Forum provides an opportunity for students to explore career options through networking with members of the CS community from industry, academia, and government. Tuesday evening, CS ManTech will host the International Reception (IR). This annual event has been a fun and memorable highlight of past conferences. This year’s IR will be held in a unique venue to provide attendees with a taste of Miami. The evening will be filled with tasty courses, libations, entertainment, and activities!
Wednesday morning begins with breakfast in the Exhibitor Hall where attendees can follow up on questions from the Exhibitors’ Forum or meet with one or two new vendors before the technical sessions begin at 8:30 am. There is a full program of parallel sessions throughout the day. Parallel sessions have been structured so that attendees can move between talks and sessions. Morning sessions focus on characterization or materials and processing or manufacturing topics. Lunch will be open to explore Miami or to get a quick rest before the afternoon sessions begin. Afternoon sessions continue with thermal management or manufacturing and heterogeneous integration or power electronics topics. Wednesday evening is host to the popular CS ManTech Rump Sessions. Eat, drink, and debate! Attendees are encouraged to join any (or all) of the four parallel highly interactive and lively discussions.

Thursday morning continues with a single session on GaN processing followed by parallel sessions on metallization or reliability. Following these sessions will be lunch sponsored by CS ManTech. After lunch there will be one serial session on passivation followed by the interactive Poster Sessions of Optoelectronic and Emerging Wide Bandgap Devices. The poster session is a unique opportunity to talk one-on-one with the authors on their challenges and discoveries. Attendees will vote for the best poster for which the winning author will receive a Best Poster Award.

The conference ends Thursday afternoon with a Closing Reception and the perennial Best Picture contest. This year’s contest will consist of combining compound semiconductor technology with a Miami flare. This can mean whatever you want it to, it is whatever your creativity can come up with! Prizes will be given to the top picture, as determined by voting of attendees at the Poster Session. Please see the MIAMI THEME PICTURE CONTEST section for more details. The Closing Reception also features the conference feedback prize drawing for an iPad Mini 2. Conference feedback will be submitted using our new Mobile Application.

On behalf of the 2016 Technical Program Committee, Welcome to Miami!

Celicia Della-Morrow
Qorvo
Technical Program Chair
2016 CS ManTech
This year the CS ManTech workshop provides a well-rounded set of industry topics. The workshop is aimed at industry engineers, students, and suppliers looking to learn about processes, and anyone curious in the III-V device arena. This year’s workshop consists of five segments led by experts in their respective domains.

The first workshop session focuses on the various types of **III-V device manufacturing**. Dr. Shiban Tiku from Skyworks Solutions in California will take us through GaAs FET, HEMT, GaAs HBT, BiFET, BiHEMT, InP, and GaN processes.

The second talk is on **Non-amplifier GaN Applications** by Dr. Robert Coffie, CEO of RLC Solutions. GaN-based high electron mobility transistors (HEMTs) have redefined solid-state RF high power amplifiers. Material and heterostructure characteristics of high breakdown field (>3 MV/cm), high mobility (>2000 cm²/V-s), high saturation velocity (>10⁷ cm/s), and high channel charge density (~10¹¹/cm²) have resulted in record setting power densities in a range of frequencies from S-band to W-band. These same material/heterostructure properties also translate into improved performance for other applications outside of RF amplifiers. In this section of the workshop, the advantages of GaN-based RF switches and GaN-based high voltage power switching devices over existing technologies will be discussed.

After a tasty sit down lunch at the Hyatt Regency Miami, we will resume the workshop with our third speaker, Dr. Samuel Graham from Georgia Institute of Technology. Dr. Graham's research focuses on the fabrication, packaging, and reliability of electronic devices. In this workshop session, “**When Things Get Hot: Thermal Characterization of Electronics**”, Dr. Graham will discuss the importance of thermal metrology, junction temperature measurement techniques, thermal interfacial resistance, and system level measurements.

The forth workshop topic is **Heterogeneous Integration**. Industry expert Dr. Augusto Gutierrez-Aitken gives this talk from Northrop Grumman Aerospace Systems (NGAS). The requirements for future systems are increasingly demanding not only from the point of view of performance, but also from size, weight, power and cost. This translates into the need for advanced integration of additional complexity and performance of electronic functions into smaller volumes. It is no longer enough to use one single semiconductor technology. Integration of several high performance CS technologies enables even higher performance of the microelectronics in an efficient and cost effective way. NGAS under the Diverse Accessible Heterojunction Integration (DAHI) DARPA program is developing heterogeneous integration processes
and design kits to integrate submicron CMOS, InP HBT, GaN HEMT and high-Q passive technologies for advanced DoD and other government systems.

The final workshop topic wraps up the day with III-V Wafer Level Packaging. Dr. Dino Ferizovic of Northrop Grumman Aerospace Systems in California gives this talk. The focus of this workshop presentation is on wafer level vertical integration and packaging of III-V active and passive technologies for microwave applications. Trade-offs in performance, size, weight, and cost benefits between traditional integrated microwave assemblies (IMA) and III-V wafer level packaging (WLP) will be explored. The discussion will also include details on the integration and intra-cavity interconnect (ICIC) processes and will be followed by an overview and examples of III-V WLP designs and technologies. In addition, the impact of thermal fatigue, environmental exposure, and mechanical stresses on the reliability of WLP technologies will be considered.
Reliability of Compound Semiconductors

Monday, May 16th, 2016
Hyatt Regency Miami
Room: Monroe
8:15 a.m. – 5:30 p.m.

The 31st annual ROCS Workshop - formerly known as the GaAs Rel Workshop - will be held in conjunction with the CS ManTech Conference on Monday May 16th, 2016, at the Hyatt Regency Miami in Miami, FL. This meeting is sponsored by the JEDEC JC-14.7 Committee on GaAs Reliability and Quality Standards and the EIA.

The ROCS Workshop brings together researchers, manufacturers and users of compound semiconductor materials, devices and circuits. Papers presenting latest results, including work-in-progress and new developments in all aspects of compound semiconductor reliability will be presented. Potential authors are invited to submit an electronic copy of a one to two page comprehensive summary, suitable for a 15 minute presentation, to rocs@jedec.org. The extended deadline for receipt of submissions is March 14, 2016; late papers of significant interest may be considered up to the date of the Workshop. The Advanced Program will be published approximately one month prior to the meeting at http://www.jedec.org/home/gaas/.

Advance registration for the workshop is $100 for students, $200 for JEDEC members, and $225 for non-members; on-site registration is $275. Registration includes a full day of ROCS presentations, two breaks, a luncheon and a copy of the Proceedings. Late registration will be available starting at 7:30 a.m. on the morning of the workshop. For further information or to register on-line (through May 2nd, 2016), visit our web site at http://www.jedec.org/home/gaas/, or contact: Peter Ersland, Workshop Chairman, M/A-COM Technology Solutions, 100 Chelmsford Street, Lowell, MA 01851, (978) 656-2817, Peter.Ersland@macom.com.
INDUSTRY EXHIBITS

As in previous years, the Exhibits will be held in conjunction with the CS ManTech Conference to establish further opportunities for interactive discussions for people from the compound semiconductor community. It offers an excellent platform for vendors and conference attendees to directly interact with each other. The benefit for attendees is finding detailed information on existing and new products and services while the benefit for Exhibitors is learning the latest results from R&D activities that may seed development of new products.

The portfolios of Vendors that are on display include manufacturers of fully functional equipment or related sub-assemblies for the development or production of devices and semiconductor materials. Others offer starting materials like substrates and gases or any type of relevant services. There will also be representations on tools for optical inspection as well as tools for evaluation of materials and components. In addition, industry journals providing the latest news from R&D labs and production companies will be represented. These journals provide an overview on what’s happening in the different markets and latest CS technology and manufacturing trends.

Conference attendees such as students, technical, and business people will receive the latest updates and detailed information by visiting the Exhibit Booths that attract their attention. Communication and exchange between vendors and conference attendees is strongly enhanced through the Exhibits Reception on Monday evening as well as the coffee-breaks during the Exhibits and conference lunch on Tuesday, all of which take place in the Exhibition Hall among the Exhibit Booths.

In conjunction with the Exhibits, the Exhibitor Forum on Tuesday demonstrates an ideal platform for companies and vendors to further solidify the understanding and knowledge regarding the unique capabilities, performance, and advantages of the Exhibitors’ products and services. With reference to the years before, a high interest from Exhibitors to participate in the Forum is expected. Due to a limited number of time slots, a confirmed presentation time will be on a “first-come, first-served” basis. A waiting list will be established for those inquiring later.

Registration for the Exhibits and Exhibitor’s Forum is available through the CS ManTech web-site www.csmantech.org. Click on “Exhibitors” and then click on “Register for Exhibit Space for the 2016 Conference and the Exhibitor Forum” or directly use www.planetreg.com/E12159375984386. For questions or for further information please contact Ruediger Schreiner, Exhibits Chair at exhibitor@csmantech.org.
2016 EXHIBITORS

Accel-RF Corporation
AIXTRON, Inc.
ASAP Co., Ltd.
AXT, Inc.
Benchmark Technologies
Brewer Science Inc.
C&D Semiconductor
California Coating Systems
Canon USA
China Crystal Technologies
ClassOne Technology
Cree, Inc.
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CS COMPOUND SEMICONDUCTOR
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Evatec AG
Ferrotec USA Corp.
FRT of America
ICAMR
II-VI Advanced Materials
II-VI EpiWorks
INNOViON Corporation
Insaco, Inc.
Inspectrology
IntelliEpi
IQE
JST Manufacturing Inc.
Kinetics
KITEC GmbH
KLA-Tencor
k-space Associates, Inc.
LayTec
Lehighton Electronics, Inc.
Levitronix Technologies LLC
Logitech Ltd.
Mersen
MicroChem Corp.
Microsanj
MicroSense, LLC
Microtronic, Inc.
NuFlare Technology, Inc.

List of 2016 Exhibitors continued on next page
List of 2016 Exhibitors - continued

OEM Group, Inc.
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Plasma-Therm, LLC
Pozzetta
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DOWA International Corporation
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Ferrotec USA Corp.
FRT of America
Gel-Pak
II-VI Advanced Materials
INNOViON Corporation
Insaco, Inc.
Inspectrology
Integrated Micro Materials
Intelligent Epitaxy Technology Inc.
IQE
JST MANUFACTURING
KITEC GmbH
KLA-Tencor
Lehighton Electronics, Inc.
Logitech Ltd
MEI Wet Processing Systems and Services
MicroChem Corp
MicroSense, LLC
Oxford Instruments
Pall Corporation
Plasma-Therm, LLC
SAMCO INC.
SawStreet LLC
Semiconductor Today
Shin-Etsu MicroSi
Silicon Materials Inc
SPTS Technologies
Strasbaugh
Sumika Electronic Materials, Inc.
Veeco PSP
Vacuum Engineering & Materials
Virginia Diodes Inc
Visual Photonics Epitaxy Co., Ltd
Wafer World Inc.
Yole
2015 BEST PAPERS AWARDS

On Tuesday morning, CS ManTech will formally recognize the authors of the best paper and best student paper from the 2015 conference. Both awards are based on conference attendee on-line feedback. The Best Paper Award is named in honor of Dr. He Bong Kim, the founder of the International Conference on Compound Semiconductor MANufacturing TECHnology.

The He Bong Kim Award winner for the 2015 Conference is:

High Power Plastic Packaging with GaN
Quinn D. Martin
M/A-COM Technology Solutions

The committee has elected to award two Best Student Paper Awards for the 2015 Conference, for which the principal student author for each paper will receive a special cash award of $1000. The Best Student Papers for the 2015 Conference are:

A CMOS-compatible Fabrication Process for Scaled Self-Aligned InGaAs MOSFETs
Jianqiang Lin, Dimitri A. Antoniadis, and Jesús A. del Alamo
MIT

Measuring the Thermal Conductivity of the GaN Buffer Layer in AlGaN/GaN HEMTs: Effect of Carbon and Iron Doping
M. Power1, J.W. Pomeroy1, Y. Otoki2, T. Tanaka2, J. Wada2, M. Kuzuhara3, W. Jantz4, A. Souzis5, M. Kuball1
1University of Bristol, 2Hitachi Metals, 3University of Fukui, 4SemiMap Scientific Instruments, 5II-VI Wide Bandgap Group

Congratulations to these award winning teams for their excellent presentation and technical contribution to our field.
INTERNATIONAL RECEPTION

Please join us for the International Reception on Tuesday evening, May 17th, aboard the Grand Floridian. This will be an exciting, fun filled 3-hour cruise on Biscayne Bay! The Grand Floridian is a brand new four level, 500 passenger yacht that docks on the Miami River behind the Hyatt Regency. A cruise along Biscayne Bay offers spectacular views of the sunset, Miami skyline, Hibiscus Island, and Star Island, which includes many celebrity homes such as Gloria Estefan, Julio Iglesias, and Don Johnson. Guests will enjoy delicious cuisine from an award winning chef, live music, and a casino on the top deck. Be sure to watch for the magician wandering through the crowd entertaining guests. As always, this will be the perfect time for everyone to connect, socialize, and have fun! One international reception ticket is included in your conference registration. Guest tickets are $75 each and can be purchased at the registration desk or in advance at www.planetReg.com/E1149425384453.

The Grand Floridian will be docked on the River Walk adjacent to the Hyatt Regency Miami - Terrace Level. The Terrace Level is also known as the lower level meeting area at the Hyatt Regency. It is accessible by elevator or through the lobby by escalator.

Boarding Time: 6:30 PM
Departure Time: 7:00 PM
(Please be on time. Boat leaves at 7 pm sharp.)
Return Time: 10:00 PM

SEMI STANDARDS MEETING

The SEMI Standards meeting is scheduled for Wednesday May 18th, from 7:00 pm to 9:00 pm (Immediately following the Rump Sessions). The SEMI Compound Semiconductor (GaAs, InP and SiC) Committee invites CS ManTech Conference attendees interested in the development of internationally approved standards for wafer specifications to attend this meeting. Topics being addressed are GaAs, InP, and SiC dimensions/orientations and electrical properties, epitaxial layer specifications (which properties should be specified, and how they are to be verified), and non-destructive test methods.

Based in San Jose, CA, SEMI is an international trade association serving more than 2,400 companies participating in the semiconductor and flat panel display
equipment and materials markets. SEMI maintains offices in Brussels, Moscow, Tokyo, Seoul, Hsinchu, Beijing, Singapore, Austin, Boston and Washington, DC. For additional information, please contact: Co-Chair: James Oliver of Northrop Grumman at 410-765-0117 or j.oliver@ngc.com, Co-Chair: Russ Kremer of Freiberger Compound Materials at 937-291-2899 or russ@fcm-us.com, or at SEMI Standards contact Paul Trio at 408-943-6900 or ptrio@semi.org.

MIAMI THEME PICTURE CONTEST

To celebrate our Miami, Florida site for this year’s conference, we are again sponsoring our popular best picture contest. Palm trees, South Beach, Little Havana, Art Deco, and Don Johnson - anything with a Miami theme is allowed! The pictures can be real or photo-shopped, have something to do with wafer fab or not, be beautiful or funny, whatever your creativity can come up with but must have a Miami flare! A gift ($100 value) will be given to the top picture, as determined by voting of attendees at the Poster Session. Help us honor our host city by submitting a picture to picturecontest@csmantech.org. Pictures will be posted on the conference message board and will be displayed during the Poster Session for voting.

CONFERENCE CLOSING RECEPTION

The Conference Closing Reception brings the 2016 CS ManTech to an end. Immediately following the Poster Session, the closing reception affords attendees one last opportunity to exchange business cards, ideas, and experiences as they reflect on the week. During the reception voting for Best Poster Presentation and Best Picture will be tallied and winners announced.

Returning this year is the Conference Feedback Raffle. Conference feedback on technical content and venue is valuable to the CS ManTech committees in structuring the conference and technical program year to year. In addition, conference feedback is used to help select the Best Paper and Best Student Paper. Each Feedback Form submitted through the conference Mobile App will be entered into a raffle for an iPad Mini 2. It’s as simple as that! The drawing will be held during the closing reception, though the winner need not be present to win.
CS MANTECH MOBILE APP

Get the CS ManTech mobile app! This year CS ManTech is featuring a new mobile app that will allow attendees to customize their conference schedules, easily find event times and locations, view papers, and connect with other attendees. The CS ManTech mobile app will also be your opportunity to rate the papers for the conference best paper awards and provide feedback on the conference.

The CS ManTech App is free and available for download on the App Store and on Google Play. Search “CS MANTECH” or scan the QR code below to take you directly to download the app. For non-smart phone users, a web-based version of the app is available at http://2016CSMANTECH.connect.omnipress.com.

2016 CS MANTECH ONLINE DIGEST

New this year to CS ManTech is the 2016 online digest. Digital copies of the papers presented at the 2016 International Conference on Compound Semiconductor Manufacturing Technology will be available for download and viewing from our online site during the conference. Printed 2016 digests will be offered to attendees who request a copy at the time of conference registration and if registration is completed by the early registration deadline (April 28th). See the REGISTRATION INFORMATION section for more details.

To access the 2016 online digest, go to to www.csmantech.org and click on “2016 Online Digest”.

Note: Digital copies of the 2016 papers will not be distributed through USB portable memory sticks as done in previous years.
2016 EXECUTIVE COMMITTEE

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Shiban Tiku, Skyworks Solutions
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Russ Westerman, Plasma-Therm, LLC
Keith Wieber, Qorvo
Sharon Woodruff, Northrop Grumman Corporation
Chris Youtsey, Microlink Devices
Guoliang Zhou, Skyworks Solutions
Heribert Zull, OSRAM Opto Semiconductors GmbH
TECHNICAL PROGRAM

Monday, May 16th

CS MANTECH WORKSHOPS
“III-V Device Manufacturing”

Chair: Alex Smith, Brewer Science

7:30 AM  REGISTRATION

8:30 AM  III-V Device Manufacturing Processes
Dr. Shiban Tiku, Skyworks Solutions

10:15 AM  BREAK

10:45 AM  Non-Amplifier GaN Applications
Dr. Robert Coffie, CEO, RLC Solutions

12:00 PM  WORKSHOP LUNCH
(CS ManTech & ROCS)

1:30 PM  When Things Get Hot: Thermal Characterization of Electronics
Dr. Samuel Graham, Georgia Institute of Technology

2:45 PM  BREAK

3:00 PM  III-V Heterogeneous Integration
Dr. Augusto Gutierrez-Aitken, Northrop Grumman Corporation, Aerospace Systems Sector

4:00 PM  III-V Wafer Level Packaging
Dr. Dino Ferizovic, Northrop Grumman Corporation, Aerospace Systems Sector

5:00 PM  WORKSHOP CLOSING

6:00 PM  EXHIBITS RECEPTION

ROCS WORKSHOPS

Chair: Peter Ersland, M/A-COM Technology Solutions

7:30 AM - 8:30 AM  ROCS Registration

8:15 AM - 5:30 PM  ROCS Workshop Sessions

12:00 PM – 1:30 PM  WORKSHOP LUNCH
(CS ManTech & ROCS)

6:00 PM  EXHIBITS RECEPTION
Tuesday, May 17th

CONFERENCE OPENING

8:30 AM  Opening Ceremonies  
David Via, Conference Chair

8:40 AM  2015 Conference Best Paper Awards  
David Via, Conference Chair

8:50 AM  Technical Program Highlights  
Celicia Della-Morrow, Technical Program Chair

SESSION 1: PLENARY I  
Chair: Celicia Della-Morrow, Qorvo

9:00 AM  Invited Presentation  
1.1 Looking Ahead to 5G  
Lauri Oksanen, VP Research & Technology  
Nokia Networks Oy

9:30 AM  Invited Presentation  
1.2 RF Technology Initiatives for 5G  
Peter Gammel, Stephen J. Kovacic  
Skyworks Solutions, Inc.

10:00 AM  BREAK

SESSION 2: PLENARY II  
Chair: Celicia Della-Morrow, Qorvo

10:30 AM  Invited Presentation  
2.1 LTE Guides the Path to the 5G Revolution  
Chris Pearson, President  
5G Americas

11:00 AM  Invited Presentation  
2.2 GaN Compelling Features for Developing RF Power Markets  
Pierre Piel, Suhail Agwani, Bruce Green, Jim Norling, Wayne Burger  
Freescale Semiconductor, Inc.

11:30 AM  Invited Presentation  
2.3 Vertical Cavity Surface Emitting Lasers in Data Networks and Consumer Devices  
Jim A. Tatum  
Finisar
Tuesday, May 17th

12:00 PM  EXHIBITS LUNCH

SESSION 3: RF GaN DEVICES

Chairs:  Shawn Burnham, HRL Laboratories
         Robert Sadler, Global Communication Semiconductors, LLC

1:30 PM  3.1 Demonstration of X-band T/R MMIC Using AFRL AlGaN/GaN MMIC Process
J.K. Gillespie¹, K.D. Chabak¹, A. Crespo¹, R.C. Fitch¹, D.W. Ferwalt³, D.E. Frey², J.D. Gassmann³, R.D. Gilbert¹, A.J. Green³, K.D. Leedy¹, R.K. Mongia³, B.S. Poling¹, K.A. Sutherland¹, S.E. Tetlak¹, J.P. Theimer¹, G.D. Via¹, D.E. Walker Jr.¹, M. Walker³, G.H. Jessen¹
¹Air Force Research Laboratory, Sensors Directorate, ²Wyle Laboratories, ³Cobham Advanced Electronics Systems

1:50 PM  3.2 Millimeter-wave GaN HEMTs with Cavity-gate Structure Using MSQ-based Inter-layer Dielectric
S. Ozaki¹,², K. Makiyama¹,², T. Ohki¹,², Y. Kamada², M. Sato¹,², Y. Niida¹,², N. Okamoto¹,², K. Joshi¹,²
¹Fujitsu Limited, ²Fujitsu Laboratories Ltd.

2:10 PM  Student Presentation
3.3 Development of K- and Ka-band High-Power Amplifier GaN MMIC Fabrication Technology
K.Y. Osipov, S.A. Chevtchenko, R. Lossy, O. Bengsston, P. Kurpas, N. Kemf, J. Würfl, G. Tränkle
Ferdinand-Braun-Institut, Leibniz-Institut für Höchstfrequenztechnik (FBH)

2:30 PM  3.4 Towards a Si Foundry-Compatible, High-Performance, ≤0.25 μm Gate, GaN-on-Si MMIC Process on High-Resistivity 200 mm <111> Si with a Cu Damascene BEOL
J. LaRoche¹, K. Ip¹, T. Kennedy¹, L. Soirez², W.J. Davis¹, J.P. Bettencourt¹, D. Guenther², G. Gebara², T. Trimble², T. Kazior¹
¹Raytheon IDS Microelectronics, ²Novati Technologies, Inc.

2:50 PM  BREAK
Tuesday, May 17th

SESSION 4: III-V Devices
Chairs: Steve Mahon
Andreas Eisenbach, IQE PLC

3:20 PM 4.1 Challenges for Establishing a High Volume, High Yielding BiHEMT Manufacturing Process
J. Li, T. Brown, M. Janani, J. Yota, C. Cismaru, M. Singh, M. Sun, and R. Ramanathan
Skyworks Solutions, Inc.

3:40 PM 4.2 Reducing Power vs. Time (PvT) Failure in BiFET2 Device Technology
S. Shamsi
Qorvo

4:00 PM 4.3 The Study of InGaP/GaAs HBT for Ruggedness Characteristics
WIN Semiconductors Corporation

4:20 PM 4.4 A Terahertz Capable 25 nm InP HEMT MMIC Process
Northrop Grumman Corporation

4:40 PM BREAK

5:00 PM EXHIBITOR AND STUDENT FORUMS
Please refer to the posted placards in the exhibit area for forum participants and scheduled presentations.

7:00 PM INTERNATIONAL RECEPTION
The International Reception will be held on The Grand Floridian yacht, which will be docked on the River Walk adjacent to the Hyatt Regency Miami – Terrace Level.

Boarding Time: 6:30 PM
Departure Time: 7:00 PM
(Please be on time. Boat leaves at 7 pm sharp.)
Return Time: 10:00 PM
Wednesday, May 18th

SESSION 5a: TEST & CHARACTERIZATION
Chairs: Marty Brophy, Broadcom, Ltd.
Gerhard Schoenthal, Virginia Diodes, Inc.

8:30 AM  5a.1 A Method for Yield and Scaling Characterization of FET Structures in an InGaP/GaAs Merged HBT-FET (BiFET) Technology
A.G. Metzger, J. Li, J. Yota, M. Sun, R. Ramanathan, C. Cismaru
Skyworks Solutions, Inc.

8:50 AM  5a.2 Accurate Prediction of Resistor Variation Using Minimum Sized Five-Resistor TLM
D.K. Mohata, C. Chueng, B.G. Moser, P.J. Zampardi
Qorvo

9:10 AM  5a.3 Characterization and Modeling of Sub-Harmonic Oscillations in GaAs and GaN FET Technologies
M. Salib, I. Ahmad
Northrop Grumman Corporation

9:30 AM  Student Presentation
5a.4 Back Bias Ramping and Photoionization Spectroscopy Analysis of GaN-on-Si HFETs
A. Pooth1,2, T. Martin2, M.J. Uren1, M. Kuball1
1Centre for Device Thermography and Reliability, University of Bristol, 2IQE (Europe) Ltd.

9:50 AM  BREAK
Wednesday, May 18th

SESSION 5b: MATERIALS & EPI

Chairs: Judy Kronwasser, NOVASiC
        Kevin Stevens, IQE

8:30 AM  5b.1 Crystal Growth and Wafer Processing of 6" Indium Phosphide Substrate
          T. Morishita¹, K. Kounoike¹, S. Fujiwara¹, Y. Hagi¹,², Y. Yabuhara¹,²
          ¹Sumiden Semiconductor Materials Co., Ltd,
          ²Sumitomo Electric Industries, Ltd.

8:50 AM  5b.2 InP Based Engineered Substrates for CPV Cells Above 46% of Efficiency
          E. Guiot¹, A. Drouin¹, C. Charles-Alfred¹, C. Drazek¹, A. de Buttet¹, A. Tauzin², T. Tibbits³, P. Beutel³, C. Karcher³, E. Oliva³,
          G. Siefer³, F. Dimroth³
          ¹SOITEC S.A., Parc Technologique des Fontaines,
          ²Univ. Grenoble Alpes,
          ³Fraunhofer Institute for Solar Energy Systems ISE

9:10 AM  Student Presentation
          5b.3 Effect of Carbon Doping on the Voltage-Blocking Properties of AlN/AlGaN/GaN Heterostructures
          M. Huber¹,², I. Daumiller¹, A. Andreev¹, M. Silvestri¹, L. Knuuttila¹, M. Wahl³, M. Kopnarski³, A. Bonanni² and A. Lundskog¹
          ¹Infineon Technologies Austria AG,
          ²Johannes Kepler University, Institute of Semiconductor and Solid State Physics,
          ³IFOS Institut für Oberflächen- und Schichtanalytik GmbH

9:30 AM  Student Presentation
          5b.4 Gallium Nitride P-N Junction Diode Based on Heated Magnesium Implantation and High Temperature Annealing
          S. Wang, I.-H. Ji, A. Huang
          FREEDM Systems Center, NC State University

9:50 AM  BREAK
Wednesday, May 18th

SESSION 6a: PROCESS – III-V TECHNOLOGY

Chairs: Heribert Zull, OSRAM Opto Semiconductors GmbH
       Sharon Woodruff, Northrop Grumman Corporation

10:20 AM  Student Presentation
6a.1 Plasma-Enhanced ALD for Improved MOS Interfaces in III-V Semiconductors
V.G. Rezazadeh1, K.M. Bothe1, A. Afshar2, K.C. Cadien2, D.W. Barlage1
1Dept. of Electrical and Computer Engineering, University of Alberta, 2Dept. of Chemical and Materials Engineering, University of Alberta

10:40 AM  Student Presentation
6a.2 Inductively Coupled Plasma Dry Etching Process Development for > 50 Gb/s 850 nm Oxide-Confined VCSELs
M. Liu, C.Y. Wang, M. Feng
Department of Electrical and Computer Engineering, University of Illinois at Urbana-Champaign

11:00 AM  6a.3 Reduction of Thin Film Stress-Induced Micro-Masking by Using Ti/Ni Hard Mask for High Power SiC RF Transistor Fabrication
S. Afroz, J. Thomen, J. Oliver, E. Jones
Northrop Grumman Corporation

11:20 AM  6a.4 Ablation Laser Dicing for GaN HEMT Device on 100µm SiC/Au Substrates
W. Skelton, V. Li, Y. Yang, A. Ketterson, M. Lube, H. Isom, C. Lee, R. Kraft
Qorvo

11:40 AM  6a.5 Temporary Bonding for Backside Processing of 150-mm SiC Wafers
R.K. Trichur, M. Hladik, and J.M. Cooper
Brewer Science, Inc.

12:00 PM  OPEN
Lunch at your own leisure or time to explore Miami
Wednesday, May 18th

SESSION 6b: MANUFACTURING – DATA & AUTOMATION

Chairs: Corey Nevers, Qorvo

10:20 AM 6b.1 Automating from Tapeout to Factory for a High-mix Fab
C. Frias
Qorvo

10:40 AM 6b.2 An Effective Data Analysis Approach to Identify Source of Parametric Performance Variations for GaAs Manufacturing
M.W. Tsai, H.T. Li, H.F. Tsai, J.W. Chen, W.H. Wang
WIN Semiconductors Corporation

11:00 AM 6b.3 Implementation of a Supplier Ship-To-Control Methodology and Resulting Improvements at Qorvo
M. Le Guilly, S. Hurtt, A. Franklin
Qorvo

11:20 AM 6b.4 Consolidation Method for SPC Data Review in a High Product Mix Semiconductor Fab
J. Carter, A. Collins
M/A-COM Technology Solutions

11:40 AM 6b.5 Outlier Labeling Method for Univariate Data for Module Test and Die Sort
T. Saeger, B. Kleven, I. Otero, M. Wallace, R. Ziglar
Qorvo

12:00 PM OPEN
Lunch at your own leisure or time to explore Miami
Wednesday, May 18th

SESSION 7a: THERMAL MANAGEMENT

Chairs: John Blevins, Air Force Research Laboratory

1:30 PM 7a.1 Developing a New Thermal Paradigm for Gallium Nitride (GaN) Device Technology
J.D. Blevins¹, G.D. Via¹, A. Bar-Cohen², A. Sivananthan³
¹Air Force Research Laboratory (AFRL), ²Defense Advanced Research Projects Agency (DARPA), ³Booz-Allen-Hamilton

1:50 PM 7a.2 GaN Unleashed: The Benefits of Microfluidic Cooling
J. Ditri¹, R. Pearson¹, R. Cadotte¹, D. Fetterolf¹, M. McNulty¹, D. Luppa²
¹Lockheed Martin, MST: ¹Moorestown, New Jersey, ²Syracuse, New York

2:10 PM 7a.3 GaN on Diamond: Pushing the Boundary of Conventional MMIC Design and Fabrication
M. Tyhach, D. Altman, V. Kaper, J. Sanctuary
Raytheon

2:30 PM 7a.4 GaN MMIC Impingement Jet Cooled Embedded Diamond
V. Gambin¹, B. Poust¹, D. Ferizovic¹, M. Watanabe¹, G. Mandrusiak², T. Dusseau²
¹Northrop Grumman Corporation, Aerospace Systems, NG NEXT, ²GE Global Research

2:50 PM 7a.5 Near Junction Thermal Transport and Embedded Cooling of High Power GaN Electronics
C.T. Creamer¹, P.C. Chao¹, K.K. Chu¹, A. Kassinos¹, G. Campbell², H. Eppich², A. Shooshtari³, S. Dessiatoun³, and M. Ohadi³, C. McGray⁴, R. Kallaher⁴
¹BAE Systems, Advanced RF Microelectronics, Technology Solutions, ²Science Research Laboratories, ³University of Maryland, ⁴Modern Microsystems

3:10 PM BREAK
Wednesday, May 18th

SESSION 7b: MANUFACTURING – DEFECTS & QUALITY

Chairs: Chang-Hwang Hua, WIN Semiconductors Corporation
        Mike Sun, Skyworks Solutions

1:30 PM  7b.1 Automated Optical Inspection (AOI) For Quality Improvement
         Y. Wang, T. Cheng, C. Chueng, P. Carroll, Z. Reitmeier
         Qorvo

1:50 PM  7b.2 Fabrication Process Induced ESD Damage of MIM Capacitors on a 0.15um pHEMT Process
         R. Waco, R. Emergo, S. Brockett, T. Rivers, Y. Wang
         Qorvo

2:10 PM  7b.3 Reduction of Capacitor Metal Defect Formation in High Volume Manufacturing
         S. Mason
         Broadcom, Ltd.

2:30 PM  7b.4 Using Six-Sigma Methodology to Reduce Metal-Insulator-Metal Capacitance
         J. Yao, L. Pagentine, D. Groft, P. Worsley, Z. Reitmeier, P. Carroll
         Qorvo

2:50 PM  7b.5 Analysis of and Solution to Ion Trim Drift Utilizing FDC Software and a Residual Gas Analyzer
         E. McCormick¹, R. Bobkowski¹, K. Mausolf², G. Takayasu¹, D. Nappa¹, F. Celi², M. McClure¹, C. Hall¹, J. Raff²
         ¹Qorvo, ²Student Intern, Northwestern University

3:10 PM  BREAK
Wednesday, May 18th

SESSION 8a: HETEROGENEOUS INTEGRATION

Chairs: Shalini Gupta, Northrop Grumman Corporation
        Paul Cooke, IQE Wireless

3:40 PM  Invited Presentation
8a.1 Beyond Silicon CMOS: Progress and Challenges
B.Y. Nguyen, M. Sadaka, G. Gaudin, W. Schwarzenbach, K. Boudelle, C. Figuet, C. Maleville
Soitec, ParcTechnologique des Fontaines

4:10 PM  8a.2 Transfer Printing of Microscale Compound Semiconductor Devices
K. Ghosal1, D. Gomez1, M. Meitl1, S. Bonafede1, C. Prevatte1, T. Moore1, B. Raymond1, D. Kneeburg1, A. Fecioru2, A.J. Trindade2, C.A. Bower1
1X-Celeprint, Inc., 2X-Celeprint Ltd.

4:30 PM  8a.3 Epitaxial Lift-off and Transfer of III-N Materials and Devices from SiC
D.J. Meyer1, B.P. Downey1, T.J. Anderson1, D.S. Katzer1, N. Nepal1, V.D. Wheeler1, D.F. Storm1, M.T. Hardy2
1Naval Research Laboratory, Electronics Science and Technology Division, 2NAS NRC Postdoctoral Fellow, residing at the Naval Research Laboratory

4:50 PM  8a.4 GaN-on-Diamond: Robust Mechanical and Thermal Properties
H. Sun1, D. Liu1, J.W. Pomeroy1, D. Francis2, F. Faili2, D.J. Twitchen2, M. Kuball1
1Center for Device Thermography and Reliability (CDTR), H. H. Wills Physics Laboratory, University of Bristol, 2Element Six Technologies U.S. Corporation

5:10 PM  RUMP SESSION RECEPTION
Wednesday, May 18th

SESSION 8b: POWER ELECTRONICS
Chairs: Tom Low, Keysight Technologies
       Naveen Tipirneni, Texas Instruments Inc.

3:40 PM Invited Presentation
8b.1 Benefits and Requirements of Using SiC and/or GaN Power Switching Devices for "Real" Power Control Systems
Masayoshi Yamamoto
Interdisciplinary Faculty of Science and Engineering, Shimane University

4:10 PM 8b.2 Dynamic-Ron in Small and Large C-doped AlGaN/GaN-on-Si HEMTs
S. Karboyan¹, M.J. Uren¹, S. Martin-Horcajo¹, J.W. Pomeroy¹, I. Chatterjee¹, P. Moens², A. Banerjee², M. Caesar², M. Kuball¹
¹H H Wills Physics Laboratory, University of Bristol, ²ON Semiconductor

4:30 PM Student Presentation
8b.3 AlGaN/GaN HEMTs on Free-standing GaN Substrates with Breakdown Voltage of 5 kV and Effective Lateral Critical Field of 1 MV/cm
J.H. Ng, J.T. Asubar, H. Tokuda, M. Kuzuhara
Graduate School of Engineering, University of Fukui

4:50 PM Student Presentation
8b.4 Investigation of Traps in AlGaN/GaN High Electron Mobility Transistors by Sub-Bandgap Optical Pumping
T.S. Kang¹, Y.H. Lin¹, S. Ahn¹, F. Ren¹, B.P. Gila², S.J. Pearton², E. Patrick³, D.J. Cheney³, M. Law³
¹Department of Chemical Engineering, University of Florida, ²Department of Materials Science and Engineering, University of Florida, ³Department of Electrical and Computer Engineering, University of Florida

5:10 PM RUMP SESSION RECEPTION
SESSION A: INDUSTRY CONSOLIDATION – COULD WE GET BETTER NAMES?
Moderator: Alexander Smith, Brewer Science

Slowing semiconductor industry growth, rising costs, and increased consumer pricing pressure is fueling an unprecedented amount of mergers and acquisitions. In 2015 alone, there were over $100 Billion in such mergers and acquisitions! There have been several consolidations in the Compound Semiconductor arena that have affected many of our attendees. Please come and share your predictions on who is next!

SESSION B: VCSEL MASS PRODUCTION - IS THERE MONEY TO BE MADE?
Moderators: Paul Pinsukanjana, IntelliEPI
Travis Abshere, nLIGHT Photonics

VCSEL's have been consistently making gains in communications, sensor, heating, and even industrial markets. Is this truly the next frontier in GaAs production? If so, who is prepared to drive this production? Will margins be high enough for VCSEL driven GaAs volume to translate into a sustainable and profitable environment? Or is this just another flash in the pan?

SESSION C: GaAs vs. Si CELL PHONE PA’s– WHO’s AFRAID OF THE BIG BAD WOLF?
Moderator: Marty Brophy, Broadcom, Ltd.

Historically, CMOS or BiCMOS has bumped GaAs from cell phone IC slots when CMOS capability was demonstrated. CMOS or other Si IC’s huffed and puffed and blew our Receiver and Antenna Switch houses down. But that has not happened for power amplifiers despite bluster and hot air from all corners of the Si world and from pundits large and small. We GaAs folks feel safe and snug from the CMOS tornado in our little brick houses. Is it time to worry again? Come to this rump session to tell us why we should or should not worry about CMOS or other Si technologies killing our killer app.

SESSION D: GaN-on-Xxx – SELECTING A SUBSTRATE IS GETTING COMPLICATED!
Moderator: Yohei Otoki, SCIOCS

Since we last debated this popular topic in 2015, our industry has witnessed ongoing adoption of GaN-on-SiC as a mainstream production technology for RF application. And while GaN-on-Si continues along as heir-
apparent to the power electronics space, it has also demonstrated compelling RF performance with a stated benefit of reduced manufacturing costs. As if that were not enough, the quality native substrates has also continued to evolve – signaling the emergence of GaN-on-GaN as a contender with some compelling performance improvements to offer. Selecting your substrate is getting so complicated! If you concur, come and hear what the experts are thinking.

7:00 PM    **SEMI STANDARDS MEETING**
SESSION 9: PROCESS - GaN

Chairs:  Dane Henry, Qorvo  
        Thomas Roedle, Ampleon

8:30 AM  9.1 Improvements in the Annealing of Ion Implanted III-Nitride Materials and Related Devices  
          Naval Research Laboratory

8:50 AM  9.2 Performance Limiting Leakage Current Across Ar-Implantation Isolation in AlGaN/GaN Structures for High Power Applications  
          J. Moereke, E. Morvan, W. Vandendaele, F. Allain, A. Torres, M. Charles, M. Plissonnier  
          Univ Grenoble Alpes

9:10 AM  Student Presentation  
9.3 Compatibility of AlN/SiN, Passivation Technique with High-Temperature Process  
          M. Hua¹, Y. Lu¹, S. Liu¹, C. Liu¹, K. Fu², Y. Cai², B. Zhang², K.J. Chen¹  
          ¹ECE Department, The Hong Kong University of Science and Technology,  
          ²Suzhou Institute of Nano-Tech and Nano-Bionics, Chinese Academy of Science

9:30 AM  Student Presentation  
9.4 Simulation of Fabrication- and Operation-Induced Mechanical Stress in AlGaN/GaN Transistors  
          S. Joglekar¹, C. Lian², R. Baskaran², Y. Zhang², T. Palacios¹, A. Hanson²  
          ¹Massachusetts Institute of Technology,  
          ²M/A-COM Technology Solutions Inc.

9:50 AM  BREAK
Thursday, May 19th

SESSION 10a: PROCESS - METALLIZATION
Chairs: Guoliang Zhou, Skyworks Solutions
        Michelle Bourke, Lam Research

10:20 AM  10a.1 Uniformity Improvement and Defect Reduction of NiCr Thin Film Resistor
          Qorvo

10:40 AM  Student Presentation
          10a.2 Nonalloyed Refractory Metals for Self-Aligned InP HBT Emitter Contacts with InAs/InGaAs Emitter Cap
          A. Winoto, J. Qiu, M. Feng
          Department of Electrical and Computer Engineering, University of Illinois at Urbana-Champaign

11:00 AM  Student Presentation
          10a.3 Vanadium-based Ohmic Contact for Aluminum-rich $n$-AlGaN
          T.-T. Kao, Y.-S. Liu, T. Detchprohm, R.D. Dupuis, S.-C. Shen
          School of Electrical and Computer Engineering, Georgia Institute of Technology

11:20 AM  10a.4 Reduction in Current Leakage Fails Through an Improved Metal Lift-off Process
          J. Hunter, J.K. Abrokwah
          Broadcom Ltd., Wireless System Division

11:40 AM  10a.5 An Evaporation Lift off Process with Unidirectional Conformal Coverage
          K. Cheng, C. MacDonald, K. Tabatabaie-Alavi
          Raytheon Company Inc., Integrated Defense Systems

12:00 PM  CS MANTECH LUNCHEON
Thursday, May 19th

SESSION 10b: RELIABILITY

Chairs: Dave Wang, Global Communication Semiconductors, LLC
       Don Gajewski, Wolfspeed, A Cree Company

10:20 AM 10b.1 RF-WLR Investigations on 0.5 µm AlGaN/GaN HEMTs
          B. Schauwecker, S. Stolz, H. Blanck
          United Monolithic Semiconductors

10:40 AM Student Presentation
10b.2 Recovery in dc Performance of Off-State Step-Stressed AlGaN/GaN High Electron Mobility Transistor with Thermal Annealing
          B.-J. Kim1, S. Ahn1, T.-S. Kang1, J. Zhu1, F. Ren1, S.J. Pearton2, D.J. Smith3
          1Department of Chemical Engineering, University of Florida, 2Department of Materials Science and Engineering, University of Florida, 3Department of Physics, Arizona State University

11:00 AM 10b.3 Mechanism of Initial Failures in Breakdown Voltage of GaN-on-GaN Power Switching p-n Diodes
          F. Horikiri1, Y. Narita1, T. Yoshida1, H. Ohta2, T. Mishima2, T. Nakamura2
          1Sciocs Company Ltd., 2Hosei University

11:20 AM Student Presentation
10b.4 Reliability Assessment of Thermally-Stable Gate Materials for AlGaN/GaN HEMTs
          1University of Maryland – College Park, 2Naval Research Laboratory

11:40 AM 10b.5 Transient Thermoreflectance for Device Temperature Assessment in Pulsed-Operated GaN-based HEMTs
          S. Martin-Horcajo1, J.W. Pomeroy1, B. Lambert2, H. Jung3, H. Blanck3, M. Kuball1
          1Centre for Device Thermography and Reliability (CDTR), University of Bristol, 2United Monolithic Semiconductors SAS, 3United Monolithic Semiconductors GmbH

12:00 PM CS MANTECH LUNCHEON
Thursday, May 19th

SESSION 11: PROCESS - PASSIVATION

Chairs: Hermann Stieglauer, United Monolithics Semiconductor GmbH
Gregg Mills, AXRTECH

1:20 PM Student Presentation
11.1 Suppression of Current Collapse in AlGaN/GaN MISHEMTs using in-situ SiN Gate Dielectric and PECVD SiN Passivation
H. Jiang\textsuperscript{1}, C. Liu\textsuperscript{1}, X. Lu\textsuperscript{2}, K.M. Lau\textsuperscript{1}
\textsuperscript{1}Department of Electronic and Computer Engineering, Hong Kong University of Science and Technology, \textsuperscript{2}State Key Laboratory of Electrical Insulation and Power Equipment, Xi’an Jiaotong University

1:40 PM
11.2 Effect of Surface Passivation on Current Collapse of Proton-Irradiated AlGaN/GaN HEMTs
A.D. Koehler\textsuperscript{1}, T.J. Anderson\textsuperscript{1}, M.J. Tadjer\textsuperscript{1}, B.D. Weaver\textsuperscript{1}, J.D. Greenlee\textsuperscript{2}, D.I. Shahin\textsuperscript{1}, K.D. Hobart\textsuperscript{1}, F.J. Kube\textsuperscript{1}
\textsuperscript{1}Naval Research Laboratory, \textsuperscript{2}NRC Postdoctoral Fellow Residing at NRL, \textsuperscript{3}University of Maryland

2:00 PM Student Presentation
11.3 Investigation of the Interface Traps and Current Collapse in LPCVD SiNx/AlGaN/GaN MISHEMTs
K. Yu\textsuperscript{1}, C. Liu\textsuperscript{2}, H. Jiang\textsuperscript{2}, X. Lu\textsuperscript{1}, K.M. Lau\textsuperscript{2}, A. Zhang\textsuperscript{1}
\textsuperscript{1}State Key Laboratory of Electrical Insulation and Power Equipment, Xi’an Jiaotong University, \textsuperscript{2}Department of Electronic and Computer Engineering, Hong Kong University of Science and Technology

2:20 PM
11.4 A SiN Passivation for Improved Moisture Reliability of Au Interconnect With Low-K BCB ILD
J.K. Abrokwah, N. Perkins, R. Snyder, S. Rumery, G. Halac, R. Long
Broadcom Ltd., Wireless Systems Division

2:40 PM
11.5 Optimization of AlGaN/GaN HEMT SiN Passivation by Mixed Frequency PECVD
United States Naval Research Laboratory
Thursday, May 19th

SESSION 12: POSTER - OPTOELECTRONIC & EMERGING WIDE BANDGAP DEVICES

Chairs: Patrick Fay, University of Notre Dame
        Allen Hanson, M/A-COM Technology Solutions

3:10 PM - 4:00 PM

Student Presentation
12.1 GaN Nanowire MISFETs for Low-Power Applications
W. Li1, K. Pourang1, S.M. Moududul Islam2, D. Jena1,2, P. Fay1
1Department of Electrical Engineering, University of Notre Dame, 2Department of Electrical and Computer Engineering, Cornell University

12.2 Doubly Self-Aligned DMOSFET in SiC for Microgravity Manufacture
P.J. Schubert
Indiana University-Purdue University

Student Presentation
12.3 The Demonstration and Characterization of In-situ SiNx/AlGaN/GaN HEMT on 6-inch Silicon on Insulator (SOI) Substrate
H.-Y. Wang, L.-Y. Peng, Y.-H. Cheng, H.-C. Chiu
Department of Electronics Engineering, Chang Gung University

Student Presentation
12.4 Investigation of InAlN/GaN Schottky Barrier Diode (SBD) on 6-inch SOI Substrate
L.-Y. Peng1, H.-C. Wang1, H.-Y. Wang1, H.-C. Chiu1, J.-I. Chyi2
1Department of Electronics Engineering, Chang Gung University, 2Department of Electrical Engineering, National Central University

Continued on Next Page
Thursday, May 19th

SESSION 12: POSTER - OPTOELECTRONIC & EMERGING WIDE BANDGAP DEVICES - Continued

3:10 PM - Student Presentation
12.5 Investigation of Thermal Stability of TiN/O$_2$-Al$_2$O$_3$/GaN Metal-Oxide-Semiconductor Diodes with 2 nm H$_2$O-Al$_2$O$_3$ as Oxide/III-Nitride Interfacial Layer
Q. Bao$^1$, S. Huang$^1$, X. Wang$^1$, K. Wei$^1$, J. Xiang$^1$, S. Chai$^1$, X. Wang$^1$, Y. Li$^1$, S. Guo$^2$, J. Li$^3$, X. Liu$^1$, C. Zhao$^1$
$^1$Key Laboratory of Microelectronic Devices & Integrated Technology, Institute of Microelectronics, Chinese Academy of Sciences, $^2$Advanced Micro-Fabrication Equipment Inc.

12.6 Withdrawn

Student Presentation
12.7 Improvement of Light Extraction Efficiency of AlGaN-based Deep-Ultraviolet Light Emitting Diodes
Y. Guo, Y. Zhang, J. Yan, X. Chen, T. Wei, J. Wang, J. Li
Institute of Semiconductors, Chinese Academy of Sciences

Student Presentation
12.8 Microwave Equivalent Circuit Modeling of 29 GHz Modulated 850 nm Oxide-Confined VCSELs
C.Y. Wang, M. Liu, M. Feng
Micro and Nanotechnology Laboratory, Department of Electrical and Computer Engineering, University of Illinois at Urbana-Champaign

Student Presentation
12.9 Improved Optical Quality and 1.26 μm Light Emission from (411) GaAsBi/GaAs MQWs Grown by MBE
P. Patil, F. Ishikawa, S. Shimomura
Graduate School of Science and Engineering, Ehime University

CONFERENCE CLOSING

4:10 PM Closing Reception & Award Presentations
Best Poster Session Paper, Best Miami Themed Picture, and Conference Feedback Raffle Prize Drawing – iPad Mini 2

Conference Closing - David Via,
Conference Chair
GENERAL INFORMATION

2016 International Conference on Compound Semiconductor Manufacturing Technology
May 16th – 19th, 2016

Hyatt Regency Miami
400 South East Second Avenue
Miami, Florida, USA 33131-2197

REGISTRATION INFORMATION (US$)

For Conference Registration, register online at www.csmantech.org. Register by April 28th to take advantage of our early bird rate.

www.csmantech.org

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Payment of the full, student, or government conference registration fee includes one copy of the printed Conference Digest (If requested at the time of registration and if registration is completed by the April 28th early bird deadline), access to the 2016 Online Conference Digest, access to the 2016 conference papers through the conference mobile app, and admission to all sessions and the exhibits. It also includes the International Reception, Exhibits Reception, Exhibits Luncheon, Rump Session Reception, Interactive Forum Reception, breakfasts, and refreshment breaks.

NOTE: Digital copies of the 2016 conference papers will not be offered on USB portable memory sticks. Conference papers will be available for download and viewing from our new 2016 online digest site using an access code that will be provided to registered conference attendees when they pick-up their registration packets.

The one-day registration includes admission to all sessions for that day, admission to the Exhibits Hall, buffet breakfast, break refreshments, Tuesday’s Exhibits Lunch, and Thursday’s CS ManTech luncheon. The Rump Session Reception or Interactive Forum Reception is included on Wednesday and Thursday, respectively. It also includes a printed Conference Digest (If requested at the time of registration and if registration is completed
by the April 28th early bird deadline) and access to the 2016 conference papers through the Online Conference Digest and mobile app. The one-day registration does not include admission to the International Reception. The one-day option can be taken only once during the conference.

Payment of workshop registration includes one copy of the Workshop Digest, breakfast, Workshop Luncheon and break refreshments. Additional copies of the Workshop Notes may be purchased for $100.

Registrants may pay by credit card. The only acceptable credit cards are Master Card, VISA, and American Express. REGISTRATION WITHOUT PAYMENT WILL NOT BE ACCEPTED. All refund requests must be received by Travis Abshere at the CS ManTech office shown below by April 28th for a full refund less a $25 processing fee. NO REFUNDS AFTER APRIL 28, 2016.

CS ManTech
14525 SW Millikan Way #26585
Beaverton, Oregon 97005-2343

For Advanced Conference Registration, register online at our Web Site by April 28th.

www.csmantech.org

HOTEL RESERVATIONS

CS ManTech has arranged for a discounted nightly rate at the Hyatt Regency Miami. The rate for single or double occupancy is $169 per night. State and local occupancy taxes (currently 13%) will be added to these rates.

The CS ManTech rate includes free guest room Internet access. For those wishing to extend their stay, a limited number of rooms are available at the group rate three days before and after the conference on a first come, first served basis.

A minimum of 72 hours’ notice is required for all guestroom cancellations. Any cancellations within this period of time may be subject to a charge of one room night and any applicable taxes.

Hotel reservations:
• The Hyatt Regency Miami recommends using the Passkey web-based registration that has been set up for the conference. You can access this web link by visiting the CS ManTech website (www.csmantech.org) and clicking on the Hyatt Regency link on the homepage.
• If you call the hotel directly, please request the CS ManTech group rate to receive the CS ManTech discounted rate.
The cut-off date for making a reservation at the Hyatt Regency Miami at the CS ManTech rate is April 22, 2016. Reservations made after this date will be subject to availability and to the prevailing rates at the Hyatt Resort.

If you require the US Government rate (ID required, prevailing per diem rate) please call the Hyatt Regency Miami directly and notify them you are attending CS ManTech.

The discounted rate is subject to availability, so please MAKE YOUR RESERVATION EARLY!

We ask you to please support CS ManTech and to enjoy all of the conference activities by staying at our official 2016 location, the Hyatt Regency Miami.

CONFERENCE REGISTRATION & INFORMATION CENTER

Conference registration is located at the Riverfront Lobby Central.

MESSAGE BOARD

A Conference Message Board will be maintained at the Registration & Information Center during registration hours. Please advise callers who wish to reach you during the day to ask the hotel operator to deliver a message to the CS ManTech Conference Registration Desk. Please check the message board periodically.

THE CONFERENCE HOTEL

Stay in the middle of the action at the Hyatt Regency Miami. Indulge in the spirit of the “American Riviera” at the hotel located just 15 minutes from South Beach and two miles from the Port of Miami. The downtown hotel is conveniently situated and easily accessible to everywhere you want to be. Discover the hotel’s wide array of services and amenities, ranging from newly renovated spacious guestrooms to delicious on-site dining options. The hotel’s striking white towers overlook the Miami River and Florida’s famed Biscayne Bay. Conference attendees will love the 100,000 square feet of flexible meeting space. Enjoy easy access to Miami’s best attractions like Mary Brickell Village, the James L. Knight Center, Coral Gables, and the Latin flavor of Little Havana.
TRANSPORTATION TO THE HOTEL

The Hyatt Regency Miami can be reached by car, taxi or shuttle bus from either the Miami International Airport (MIA) or the Fort Lauderdale-Hollywood International Airport (FLL). The Hyatt Regency offers both self-parking (with no in/out privileges) at $19, payable by cash or credit card; and valet parking (with in/out privileges). See the Hyatt Regency Miami Parking website for more details on valet parking rates and restrictions. http://miamiregency.hyatt.com/en/hotel/our-hotel/parking.html

From the Miami International Airport (MIA):

- **Shuttle Service** - Recommended shuttle is Super shuttle Transportation. No reservation required from the airport to the hotel, however, it is required from the hotel to the airport with 24 hours’ notice required.
- **Limo Service** - Worldwide Transportation 877-871-5466
- **Taxi** - Tax service from Miami International Airport (MIA) is approximately $21.00 one-way
- **Car** – (8 miles) Take 836 east, go through tolls and stay to right side. Take I-95 South Exit - Downtown. Once on I-95, stay in left hand lane and take Exit 2A/Biscayne Boulevard. Stay in right hand lane at the end of the ramp, the Hyatt Regency Miami hotel will be on your immediate right side.

From the Fort Lauderdale-Hollywood International Airport (FLL):

- **Shuttle Service** - Recommended shuttle company is Go Shuttle. No reservation required from the airport to the hotel, however, it is required from the hotel to the airport with 24 hours’ notice required. Go Shuttle contact: 954-561-8888.
- **Taxi** - Taxi service from the Fort Lauderdale-Hollywood International Airport (FLL) is approximately $75-$80 one way
- **Car** – (1.9 miles) Head south on South East Second Ave. and turn left onto Biscayne Boulevard. Turn right onto Port Blvd. for 0.8 miles. Turn right onto N. America Way, and then turn right onto Caribbean Way which becomes N. America Way.

Additional Transportation Options:

- Car services such as Uber and Lyft are available in Miami. Please use the appropriate app or visit the service’s website for details.
- The Metro Rail offers transportation from the Airport and makes multiple stops around the City. To view the map, schedules and pricing of the
Metro rail please visit the metro rail website.  
www.miamidade.gov/transit/metrorail

- Dolphin Mall offers a shuttle service to and from the mall at a cost of $12.00 per person. Contact the Hyatt Regency Miami concierge for shuttle times.
- The City of Miami offers a free trolley service for your convenience. Please visit their website for times and maps. www.miamigov.com/trolley

**FINANCIAL ASSISTANCE**

CS ManTech encourages presentations and participation by academic delegates. To support this participation, limited funding is available to support travel and conference attendance by student presenters. Requests will be considered on a first-come, first-served basis. Please see www.csmantech.org/students/students for details regarding the guidelines and requirements on applying for financial assistance. Requests or questions may be sent to the CS ManTech University Liaison at student.aid@csmantech.org.
CS ManTech Wants Your Feedback

Download the CS ManTech Mobile App to submit feedback on the conference. Your feedback will be used by the Technical Program Committee to improve future year’s conferences.

Each feedback form submitted through the CS ManTech App will be entered into a raffle for an iPad Mini 2!

The Conference Feedback raffle drawing will be held during the Closing Reception. (winner need not be present to win)
Get the CS ManTech App!

Search “CS MANTECH” or scan the QR code below to take you directly to download the app.

For non-smart phone users, a web-based version of the app is available at http://2016CSMANTECH.connect.omnipress.com

2016 CS ManTech Digest is ONLINE

Go to www.csmantech.org and click on “2016 Online Digest”.
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