

# 2016 2<sup>nd</sup> AFRL Workshop on Beta-Ga<sub>2</sub>O<sub>3</sub> Synthesis, Characterization and Applications

**Drs. Gregg Jessen; Ken Goretta | December 12-13, 2016 | Arlington, VA**

Basic Research Innovation and Collaboration Center (BRICC)  
4075 Wilson Blvd., Suite 350 | Liberty Room  
Arlington, VA 22203

## Agenda Day 1 | December 12, 2016

Time	Title	Speaker
7:30	Registration	
8:00-8:10	Introduction and US Perspective	<b>Dr. Gregg Jessen</b> (AFRL)
8:10-8:20	Ga <sub>2</sub> O <sub>3</sub> Fundamental Science Perspective	<b>Dr. Ali Sayir</b> (AFOSR)
8:20-9:00	Global Snapshot	<b>Dr. Masataka Higashiwaki</b> (NICT Japan); <b>Dr. Michele Baldini</b> (IKZ Germany)
9:00-10:00	Epitaxy and Opportunities Afforded by Native Substrate Availability	<b>Discussion Lead Prof. Jim Speck</b> (UCSB): < 15 min + 45 min open discussion
10:00-10:10	<b>BREAK</b>	
10:10-11:10	Electronic Transport and Devices	<b>Discussion Lead Prof. Debdeep Jena</b> (Cornell): < 15 min + 45 min open discussion
11:10-12:25	<b>LUNCH ON YOUR OWN</b>	
12:25-13:25	Materials Characterization and Challenges	<b>Discussion Lead Dr. Steve Ringel</b> (OSD): <15 min +40 min open discussion
13:25-14:15	Modeling and Simulation	<b>Discussion Leads Dr. Stefan Badescu</b> (AFRL) and <b>Dr. Eric Heller</b> (AFRL): 10 min atomistic + 10 min device sim + 30 min open
14:15-14:15	<b>BREAK</b>	
14:25-15:05	Commercial Materials and Reactor Development	Open forum for providers of Bulk Substrates, Epitaxial Materials, Reactors with opening remarks by <b>Dr. Akito Kuramata</b> (NCT Japan)
15:05-15:35	Applications	Industry Application Discussion
15:35-17:00	Summary and Identification of Knowledge Gaps	Group Activity

<b>17:00</b>	<b>MEETING ADJOURN FOR THE DAY</b>	
<b>17:45-19:45</b>	<b>Social:</b> The Front Page 4201 Wilson Blvd., Arlington, VA 22203 703-248-9990	<a href="http://www.frontpagearlington.com">www.frontpagearlington.com</a>

<b>Technical Discussion Topics Day 1   December 12, 2016</b>	
<b>Topic</b>	<b>Speaker/Organization</b>
<b>Overview</b>	
Introduction	G. Jessen, AFRL
Ga <sub>2</sub> O <sub>3</sub> Fundamental Science Perspective	A. Sayir, AFOSR
The Rise of Ga <sub>2</sub> O <sub>3</sub> for a New Era of Power Electronics	M. Higashiwaki, NICT
Growth of Homoepitaxial $\beta$ -Ga <sub>2</sub> O <sub>3</sub> Layers by MOVPE for Power Electronics Applications	M. Baldini, IKZ
<b>Epitaxy and Opportunities Afforded by Native Substrate Availability</b>	
Ga <sub>2</sub> O <sub>3</sub> Materials Synthesis by MBE	J. Speck, UCSB
Non-polar GaN Epitaxy on (010) Ga <sub>2</sub> O <sub>3</sub>	Y. Cao, HRL
Synthesis and Characterization of LPCVD beta-Ga <sub>2</sub> O <sub>3</sub> Films	H. Zhao, CWRU
CZ Growth of beta-Ga <sub>2</sub> O <sub>3</sub>	D. Thomson, AFRL
<b>Electronic Transport and Devices</b>	
Gallium Oxide Electronic Devices	D. Jena, Cornell
High-Voltage E-mode and High-Current D-mode FETs	K. Chabak, AFRL
Transport and Doping in Ga <sub>2</sub> O <sub>3</sub> Transistors	S. Rajan, OSU
Electronic Transport Characterization of beta-Ga <sub>2</sub> O <sub>3</sub>	S. Mou, AFRL
Record Drain Currents on GOOI D/E-modes FETs	P. Ye, Purdue
Ga <sub>2</sub> O <sub>3</sub> Schottky diodes on MBE and HVPE epi	A. Corrion, HRL
Ga <sub>2</sub> O <sub>3</sub> /Dielectric Interface Characterization and Transport in Ga <sub>2</sub> O <sub>3</sub>	U. Singiseti, U. Buffalo
<b>Materials Characterization and Challenges</b>	
Ga <sub>2</sub> O <sub>3</sub> Materials Characterization	S. Ringel, OSU
Characterization of beta-Ga <sub>2</sub> O <sub>3</sub> Contacts and Interfaces	L. Porter, CMU
Growth and Characterization of Homo- and Heteroepitaxial beta-Ga <sub>2</sub> O <sub>3</sub> thin films	M. Tadjer, NRL
Low-Ohmic Contact and Hall Sampling on MBE, VPE, LPCVD Materials	A. Green, WYLE
Characterization of b-Ga <sub>2</sub> O <sub>3</sub> MOS Capacitors with High-k Dielectrics	C. Young, UT Dallas

Interfaces in Ga2O3 Power Semiconductor Devices	S. Choi, Penn State
<b>Modeling and Simulation</b>	
Ga2O3 Atomistic Modeling	S. Badescu, AFRL
Device Level Modeling and Thermal Simulations with Sentaurus Device	E. Heller, AFRL
GW Results for beta-Ga2O3 including Lattice Polarization Corrections and the Absorption Edge Anisotropy	W. Lambrecht, CWRU
Ab initio Simulations on Controlling the Conductivity in Ga2O3	J. Varley, LLNL
<b>Commercial Materials and Reactor Development</b>	
Ga2O3 Materials and Commercial Availability	A. Kuramata, NCT
	D. Hanser, Veeco
Growth of Bulk Single Crystal Gallium Oxide	K. Stevens, Synoptics
HVPE Capabilities and Ga2O3 Growth Tool Development	J. Leach, Kyma
Ga2O3 MOCVD Tool Hardware and Process Issues	G. Tompa, SMI
5 um per hour Growth Rates of High Quality b-GaO by MOCVD	A. Osinsky, Agnitron
<b>Summary and Identification of Knowledge Gaps</b>	

<b>Agenda Day 2   December 13, 2016</b>		
<b>Time</b>	<b>Title</b>	<b>Speaker</b>
<b>7:30</b>	<b>Registration</b>	
<b>8:00</b>	Rehash and Discussion on Application Space	This is a forum where non-proprietary application oriented discussions are encouraged and may include ITAR/EAR information.
<b>9:00</b>	Reserved by appointment	
<b>9:20</b>	Reserved by appointment	
<b>9:40</b>	Reserved by appointment	
<b>10:00</b>	Break	
<b>10:10</b>	Reserved by appointment	

<b>10:30</b>	Reserved by appointment	
<b>10:50</b>	Reserved by appointment	
<b>11:10</b>	Reserved by appointment	
<b>11:30</b>	Break	
<b>11:40</b>	<b>Gov't Caucus</b>	Gov't only discussion on program coordination and technical direction
<b>12:45</b>	<b>MEETING ADJOURN</b>	