

## OXIDES FOR ELECTRONIC APPLICATIONS

August 16-18, 2021 / online



## LECTURERS

**Huili (Grace) Xing**

is the William L. Quackenbush Professor of Electrical and Computer Engineering at Cornell University where she holds a joint appointment in the School of Electrical and Computer Engineering and the Department of Materials Science and Engineering.

**Debdeep Jena**

is the Richard E. Lunquist Sesquicentennial Faculty Fellow, Professor at Cornell University where he holds a joint appointment in the School of Electrical and Computer Engineering and the Department of Materials Science and Engineering.



**The central research theme** in the Jena-Xing Laboratory is to develop electronic grade semiconductors and understand the fundamental limits of these materials and their applications. The essential scientific tools the group uses include epitaxy, basic material characterizations, transport theory and experiments, device theory and experiments.

**The current research** of the Semiconductor Group can be loosely grouped into the following areas: AlN, BN, Ga<sub>2</sub>O<sub>3</sub>, other nitrides and oxides such as superconductors, ferroelectrics and magnetics, in terms of materials; millimeter-wave electronics, power electronics, light emitting devices, DUV, non-linear optical properties in engineered materials, memory in terms of applications.

<https://jena-xing.engineering.cornell.edu/>

## ORGANIZATION

The Summer School is a cooperation between the [Leibniz-Institut für Kristallzüchtung \(IKZ\)](#) and the [Leibniz ScienceCampus „Growth and Fundamentals of Oxides for electronic applications“ \(GraFOx\)](#). This project is performed in the framework of GraFOx, a Leibniz ScienceCampus partially funded by the Leibniz Association.

**Organizational details:**

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**Summer School website:**

[www.ikz-berlin.de/en/about-us/events/13th-ikz-summer-school](http://www.ikz-berlin.de/en/about-us/events/13th-ikz-summer-school)

**Registration:**

Please send an email to [summer.school@ikz-berlin.de](mailto:summer.school@ikz-berlin.de) with details of your institution and position.

Summer School participation is free of charge.

The number of attendees is limited to 100.

**Registration deadline: August 9**

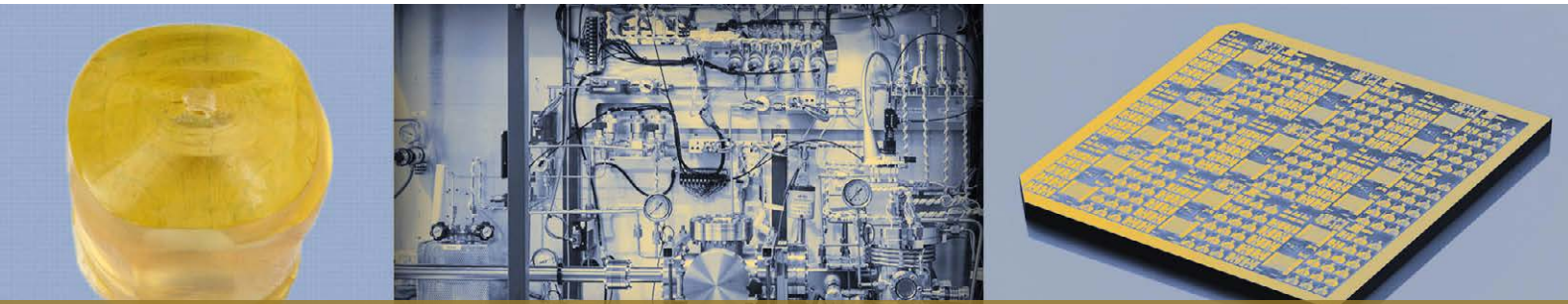
**Zoom session:**

Registered participants will receive the access data by email.

**Poster session:**

If you would like to present your scientific results as a poster during the Summer School, please submit an one page abstract with the registration.

## OXIDES FOR ELECTRONIC APPLICATIONS



### SCHEDULE

#### Monday, August 16

##### 2 - 4 pm: Lecture 1

##### *Electronic structure of wide bandgap oxides*

- ♦ Chemical bonding of oxide crystals
- ♦ Structural phases of gallium oxide family of semiconductors
- ♦ Electronic bandstructure
- ♦ Orbital characteristics and symmetries of band-edge and high energy bands
- ♦ Brief discussion of dopants and defect states
- ♦ Summary of electronic structure

##### 4 - 6 pm: Lecture 2

##### *Electronic and photonic properties*

- ♦ Electron and phonon bandstructure
- ♦ Optical properties
- ♦ Carrier scattering mechanisms
- ♦ Low-field electron mobilities, fundamental limits in bulk and 2DEGs
- ♦ General transport coefficients: Electrical and thermal conductivity, Seebeck and Peltier coefficients
- ♦ High-field transport: velocity saturation, impact ionization, and breakdown fields
- ♦ Summary of electronic, photonic and thermal properties

#### Tuesday, August 17

##### 2 - 4 pm: Lecture 3

##### *Oxide electronics fundamentals*

- ♦ Schottky junction
- ♦ PN junction
- ♦ MOS junction
- ♦ Ohmic contacts
- ♦ Breakdown mechanisms in each type of junctions
- ♦ Speed of RF devices
- ♦ Speed of power switching devices

##### 4 - 6 pm: Poster Session with break out rooms

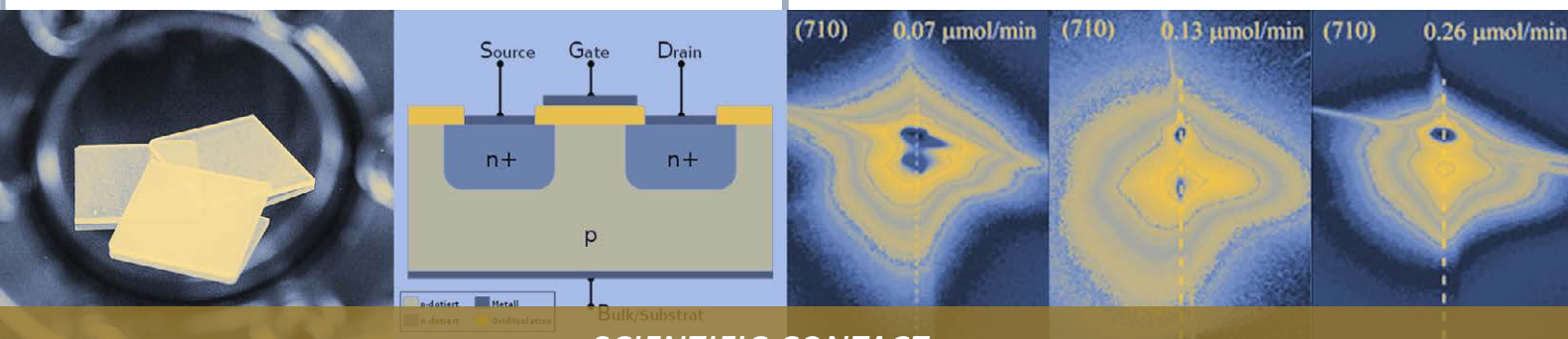
#### Wednesday, August 18

##### 2 - 4 pm: Lecture 4

##### *Ga<sub>2</sub>O<sub>3</sub> electronics: state-of-the-art*

- ♦ Schottky power diodes
- ♦ Lateral and vertical power transistors
- ♦ RF transistors
- ♦ PN heterodiodes and their applications
- ♦ Power density and thermal management
- ♦ Considerations for devices under operation

##### 4 - 6 pm: Roundtable Discussion



### SCIENTIFIC CONTACT

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