

## Second PhD Summer School on Defects in Semiconductors Ghent University, Belgium 10-14 September 2018

Goal of the 5-days doctoral school is to introduce PhD students, researchers and engineers from industry to defects in semiconductors and their important impact on the characteristics of electronic devices and on the yield of wafer and device processing. All aspects of defects in semiconductors will be dealt with, ranging from fundamental aspects like their atomic structure, origin, electronic and optical properties, over the best suited characterization and simulation techniques, to their impact on devices and process yield including defect engineering. While most of the knowledge has been gained in the past on silicon materials and processing, there is a renewed strong interest in defect control and engineering, in order to add new functionalities on a silicon platform. This ranges from sustainable applications like high performance semiconductor-based solar cells, solid-state lighting (GaN-on-silicon Light Emitting Diodes) and power devices to future Complementary Metal-Oxide-Semiconductor (CMOS) devices and beyond (Tunnel-Field-Effect Transistors; nanowire transistors).

The 5-days doctoral school is divided into an Introductory Day (Tutorials) and 3 days of Lectures, which will be given by internationally renowned experts in the field. The fifth day will provide hands-on experience on defect spectroscopy and modeling. PhD student participants are encouraged to make a poster to present and discuss their research. The Tutorials cover the following topics:

### **Defects in semiconductors: basic definitions and structural and electrical properties**

#### **Defect characterization techniques**

#### **Basics of semiconductor devices**

#### **Basics of semiconductor processing steps**

The Lectures include:

#### **Defects in substrates and epitaxial layers**

#### **Processing-induced defects and defect engineering**

#### **Interface and bulk defects – impact on devices**

#### **Impact of defects on electrical performance and yield**

For more information and preregistration, please visit the website: <http://www.defects.ugent.be>

**Please preregister before May 15th.**

**Registration: May 16th – June 27th.**

### ***International Scientific Committee:***

Prof. E. Simoen (Ghent University, Belgium)  
Prof. E. Gaubas, (Vilnius University, Lithuania)  
Dr. G. Kissinger (IHP, Frankfurt/Oder, Germany)  
Prof. J. Murphy (Warwick University, UK)  
Prof. K. Sueoka (Okayama Prefectural University, Japan)  
Prof. D. Yang (Zhejiang University, Hangzhou, China)

### ***Interuniversity Organizing Committee:***

Prof. H. Vrielinck (Ghent University)  
Prof. C. Claeys (KU Leuven)  
Prof. E. Simoen (Ghent University)  
Prof. A. Stesmans (KU Leuven)  
Prof. J. Verbeeck (University of Antwerp)

### ***Local Organizing Committee:***

Prof. H. Vrielinck  
Prof. S. Cottenier  
Prof. E. Simoen  
Prof. J. Lauwaert  
Dr. S. Khelifi  
Ing. N. De Roo & Mr. K. Daelman

*Tentative program (including dates and time schedule)*

### **Monday 10 September: Tutorials**

08.45-09.00 : Welcome and introductory remarks (Henk Vrielinck)  
09.00-10.00 : Defects in semiconductors: basic definitions and structural properties (Cor Claeys)  
10.00-10.30 : Break  
10.30-11.30 : Defects in semiconductors: electrical properties (Henk Vrielinck)  
11.30-12.30 : Transmission electron microscopy as a characterisation tool for semiconductor devices (Giulio Guzzinati)  
12.30-14.00 : Lunch  
14.00-15.00 : Basics of semiconductor devices (Eddy Simoen)  
15.00-16.00 : Basics processing steps Part I (Rita Rooyackers)  
16.00-16.30 : break  
16.30-17.30 : Basic processing steps Part II (Rita Rooyackers)

### **Tuesday 11 September: Defects in substrates and Epitaxial Layers**

08.45-09.00 : Welcome and introductory remarks (Eddy Simoen)  
09.00-10.00 : Grown-in defects in semiconductor substrates (Cor Claeys)  
10.00-10.30 : Break  
10.30-11.30 : Introduction to epitaxial growth (Andriy Hikavyy)  
11.30-12.30 : Grown-in defects in hetero-epitaxy on silicon and their control (Bernardette Kunert)  
12.30-14.00 : Lunch  
14.00-15.00 : Defects in mc-Si for photovoltaics (John Murphy)  
15.00-16.00 : Defects in III-N materials on Si (Ming Zhao)  
16.00-16.30 : break  
16.30-17.30 : Using carrier lifetime measurements to study defects in semiconductors (John Murphy)  
17.30-19.00 : Student poster session + reception

### **Wednesday 12 September: Processing-induced defects and Defect Engineering**

09.00-10.00 : Defects in wafer thermal processing (Gudrun Kissinger)  
10.00-10.30 : break  
10.30-11.30 : Ion-implantation induced defects (Marie-Luisa Polignano)  
11.30-12.30 : Metal contacts and conformal coating technology (Christophe Detavernier)  
12.30-14.00 : lunch  
14.00-15.00 : Isolation-induced defects (Rita Rooyackers)  
15.00-16.00 : Processing-induced metal contamination (Marie-Luisa Polignano)  
16.00-16.30 : Break  
16.30-17.30 : Defect passivation and gettering (Gudrun Kissinger)  
17.30-19.00 : Student poster session

### **Thursday 13 September: Interface and Bulk Defects – Defect Modeling**

09.00-10.00 : Interface and oxide defects – electrical characterization (Ben Kaczer)  
10.00-10.30 : break  
10.30-11.30 : Interface/oxide defects: spectroscopic characterization (EPR) (Andre Stesmans)  
11.30-12.30 : Characterisation of 2D materials with transmission electron microscopy (Nicolas Gauquelin)  
12.30-14.00 : Lunch  
14.00-15.00 : An introduction to first-principles simulations (Geoffrey Pourtois)  
15.00-16.00 : Modeling of defects in different phases of matters: from three-dimensional crystalline/amorphous materials to two-dimensional ones (Geoffrey Pourtois)  
16.00-17.00 : An introduction to device modelling with SCAPS (Johan Lauwaert)

### **Friday 14 September: Hands-on sessions (H. Vrielinck, E. Simoen, J. Lauwaert, S. Cottenier)**

Two parallel sessions of two times 3 h

Session 1 : Practical introduction to DFT calculations and Scaps Simulations

Session 2 : Practical introduction to defect spectroscopy: DLTS and EPR

17.30 : End of the School.