Newsletter: Fall 2018

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Swedish Center for III-Nitride Technology

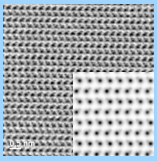
Next Board Meeting 8 November, 2018 at ABB Västerås

C3NiT Board approves two SME Instrument proposals:
1) GaN RF HEMTs and MMIC Technology by Gotmic
2) Modelling and verification of GaN growth system by Epiluvac and SweGaN

We welcome a new administrative coordinator for the Center - Anna Ahlgren
anna.ahlgren@liu.se
+46 13 28 18 79

PROJECT UPDATES

New hot-wall MOCVD reactor: LiU, SweGaN and Epiluvac are currently installing a new hot-wall MOCVD reactor (Gandalf) at LiU. Gandalf is based on a completely new concept of introducing the gases via a novel injector and is quartz-free.



N-polar GaN/AlN heterostructures: LiU has successfully developed N-polar GaN on AlN on 4° off-cut SiC (000-1). Current research efforts include optimizing the interface in order to obtain 2DEG with high density and mobility parameters.

p–type doping via Mg implantation: LiU is working in collaboration with Naval Research Laboratories, Washington D.C. for implantation of GaN with Mg. Their unique rapid annealing technique has previously yielded magnesium activation efficiency of 8.2%.

1 kV HEMT: ON Semi, SweGaN LiU, and Chalmers are exploring the high voltage capability of SweGaN's Quanfine™ - structure. The material is grown by SweGaN and LiU, Chalmers will perform HEMT processing, and ON have specified transistor structure and will be responsible for the high voltage characterization.

C-doping in AlGaN back-barriers: We study AlGaN back-barrier doped with C to mitigate short channel effects for high frequency operation at and beyond Ka-band. Initial pulsed IV measurements show correlation of dispersion and C content.

GaN MMIC: Chalmers and Gotmic are currently characterizing and modeling the HEMTs that will be used for the first GaN MMIC round. Initial measurements indicate that the devices will suitable for PAs at least up to V-band. BCB processing has been initialized and design rules for initial designs will be distributed shortly.

C3NiT Day – Project Discussions 4 December, 2018 at LiU

C3NiT recruits four new PhD students: Björn Hult, Dat Tran, Rosalia Delgado and Alexis Papamichail

Björn's research focuses on power devices and his initial project concerns the dependence of stress in dielectric layers (passivation and encapsulation) on leakage currents.
Dat works on investigating and optimizing thermal and electrical properties of III-N epilayers and heterostructures for rf and power devices.
Rosalia works on elaborating thick Ga(Al)N layers by hot-wall MOCVD on bulk GaN and nanowire templates for power switches and diodes.
Alexis develops *p*-type doping of Ga(Al)N, in-situ and via Mg implantation, trench regrowth, and his project includes also characterization/optimization of transport properties.

RESEARCH HIGHLIGHTS

Recent Publications

Y.-K. Lin et al. " A versatile low-resistance ohmic contact process with ohmic recess and low-temperature annealing for GaN HEMTs", Semiconductor Science and Technology, 2018. doi: 10.1088/1361-6641/aad7a8
Jr-T. Chen et al. "A GaN–SiC hybrid material for high-frequency and power electronics", Applied Physics Letters 113, 041605 (2018).
N. Armakavicius et al. "Electron effective mass in $In_{0.33}Ga_{0.77}N$ determined by mid-infrared optical Hall effect", Applied Physics Letters 112, 082102 (2018).

Conferences

I. Angelov et al. "On the large Signal Modeling of MM wave GaAs PIN diodes", Compound Semiconductor Week, 2018 (Invited talk)
I. Angelov, "Modeling Semiconductor devices for PA", European Microwave Week, 2018, (Invited talk)
H. Zhang, "Hot-all MOCVD growth of N-polar AlN nucleation layers in SiC, (000-1)" 7th Int. Symp. on Growth of III-Nitrides 2018 (talk)