

PhD position at TU Vienna

Role of extended defects on electrical characteristics of devices based on GaN-on-Si substrates

Gallium nitride (GaN) - based high electron mobility transistors (HEMTs) based on GaN-on-Si substrates have huge perspective for next-generation power converters. Although GaN electronic devices are already on market, their electrical performances and reliability are still far from theoretical expectations offered by wide energy band gap of GaN. It is due to large number of defects related to lattice mismatch between GaN and Si. In particular, the role of extended defects, as dislocations, on leakage current, breakdown and long-term device reliability is still discussed with often controversial conclusions.

The topic of this PhD thesis is the electrical characterization of different kind of test structures with the goal to find relation between defect type and specific electrical signatures. Current-voltage, low frequency noise (in time and frequency domains) and pulse breakdown characterization techniques will be combined with various overstress and accelerated aging methods. The results of electrical analysis obtained at TU Vienna will be correlated with the results of structural and analytical techniques as e.g. electron microscopy of our project partners. The obtained experimental data will be physically interpreted and eventually modelled.

The topic is suited both for electrical engineers and physicists with the interest in semiconductor device physics and electronics. The work will be performed in the frame of EU project called ALL2GaN (“Affordable smart GaN IC solutions for greener applications”) with over 40 EU partners covering whole supply chain from material epitaxy to power switching. In particular, there will be a close collaboration with Infineon Technologies Villach in their effort to develop novel GaN power technologies for green energy solutions. The research results of the PhD student will be presented in scientific journals, conferences and project meetings.

Requirements: Completed master study in electrical engineering or physics, English, basic knowledge of semiconductors and device physics; programming in Matlab is welcome

Duration: 3 years

Start: Summer 2023

Salary: Brutto 2.300Euro/Month paid 14 times in year (see <https://www.fwf.ac.at/en/research-funding/personnel-costs>), with possibility of increased salary depending on experience

Contact person: Associate Professor Dr. Dionyz Pogany, Institute for Solid State Electronics, Vienna University of Technology, Gusshausstrasse 25, 1040 Wien, Austria

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