Press Release

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Joint team from SweGaN, IEMN and Linköping University reveals ground-breaking epitaxial growth to produce new generation GaN-on-SiC epiwafers for power devices

- *New hybrid GaN−SiC material promising significant power savings in hybrid Electric Vehicles (EV), EV and charging stations for EV, as well as PhotoVoltaic (PV) solar inverters and other high power applications*

SweGaN AB, a manufacturer of custom-made GaN-on-SiC epitaxial wafers based on unique epitaxal growth technology for leading components and devices for satellite, communications and defense organizations today announced a ground-breaking development. SweGaN collaborated with top scientists from Linköping University in Sweden and IEMN, a French research group dedicated to high power devices, unveiling a revolutionary new epitaxial growth mechanism, *Transmorphic Heteroepitaxy*, for producing next generation GaN-on-SiC power devices. Key research from a project funded by the EU Horizon 2020 research and innovation programme (grant agreement no. 823260) was an important contribution to the new development.

- Latest findings from the research collaboration and details of the joint teams are published as **Featured Article** in **Applied Physics Letters**, Volume 115, Issue 22, November 25th, "Transmorphic Epitaxial Growth of AlN Nucleation Layers on SiC Substrates for High-Breakdown Thin GaN Transistors".

SweGaN collaborated with the scientists in electron microscopy and modeling from Linköping University, Sweden and the senior researchers from IEMN in France to explore the nature of the new epitaxial growth mechanism and the potential of SweGaN's QuanFINE® heterostructures for high power applications.

According to SweGaN, these newest findings place the company in the forefront of heteroepitaxy technology for producing QuanFINE®, a hybrid GaN–SiC material for manufacturers of power devices - in addition to its current product portfolio for RF components and devices.

“Not only is this a high-impact innovation, but comes together with a scientific discovery of a novel epitaxial growth mechanism, what we coin *transmorphic*, " says Lars Hultman, co-author of the publication, and professor at Linköping University and member of the Royal Swedish Academy of Sciences.

“This breakthrough could significantly reduce the power loss for high power devices, which would truly manifest the superiority of GaN power devices over Si super-junction power devices and SiC MOSFETs for 650V rated devices ”, says Jr-Tai Chen, CTO at SweGaN AB.

Summary of key findings from the joint collaboration
The newest groundbreaking results show an epitaxial growth - *Transmorphic Heteroepitaxy* - where less than 1nm-thin atomic interlayers with ordered vacancies are made to sufficiently accommodate the lattice mismatch at the interface between the first epilayer and the substrate.

- This new growth mechanism suppresses the formation of structural defects in the beginning of the epitaxy, which enables grain-boundary-free AlN nucleation layers and subsequent high-quality buffer-free GaN-based heterostructures to be realized on SiC substrates.
- A GaN HEMT heterostructure with a total thickness less than 300 nm grown by the transmorphic epitaxial scheme on a semi-insulating SiC substrate shows a lateral critical breakdown field of ~2 MV/cm and a vertical breakdown voltage of ≥ 3 kV, measured by the senior researchers at IEMN.
- The critical breakdown field is nearly 3 times higher than that of GaN-on-Si epiwafers grown by the conventional thick-buffer approach. This means that the device ON-resistance has potential to be lower by > 1 order magnitude than the value achievable today, according to Baliga's Figure of Merit.

"With these new results, SweGaN will now extend focus of its QuanFINE® technology to include the global power market in addition to RF devices for satellite, communications and defense organizations, particularly in Asia showing the most hunger for new generation GaN power devices," continues Jr-Tai Chen. "We anticipate releasing more new findings on the performance of QuanFINE® based power devices in the near future."

About QuanFINE® products
The unique, extremely simplified QuanFINE® heterostructure provides superior electrical and thermal properties including low current dispersion, excellent heat dissipation and high breakdown performance, to ensure the best long-term return-on-investment for customer product development for RF and power applications. SweGaN provides customers with customized products and services not available with other offerings on the market.

About SweGaN
SweGaN manufactures high quality, custom-made materials and epitaxial wafers based on the unique epitaxal growth technology for manufacturers of leading components and devices for satellite, communications and defense organizations. The ground-breaking performance of SweGaN QuanFINE® technology and quality materials enables our customers to quickly adapt to the evolving challenges of next generation high power, high frequency devices to create future-oriented solutions. With headquarters in the technology hub of Linköping, Sweden, SweGaN maintains close collaboration with renowned research groups at Linköping University and Chalmers University of Technology. For more information, visit us as www.swegan.se and LinkedIn.

SweGaN media contact
Leslie Johnsen
Communications Advisor
Mob: +47 41 45 80 43
Email: leslie.johnsen@swegan.se
Visit: www.swegan.se