# **Newsletter No 81**



LaŷTec AG · Seesener Str. 10–13 · 10709 Berlin · Germany · Tel.: +49(0)30·3980080-0 · Fax: +49(0)30·3980080-80 · info@laytec.de · www.laytec.de

### **Dear Readers!**

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## The whole LayTec Team wishes you and your families a Merry Christmas and a healthy and prosperous New Year!

Looking back to the successful year 2012, we would like to thank you for taking time to read our newsletter, for your honest feedback and for motivating us to generate new ideas! Instead of gifts that we sent to our partners in the last years, we have made donations to two foundations for victims of natural disasters (Diakonie and Caritas) as well as to two local organisations that take care of homeless people. We hope you will support us in this decision.

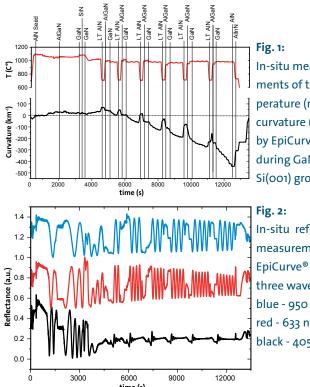
Stay with us in 2013 and keep up-to-date with the latest developments in the field of epitaxial growth monitoring!

## Advanced stress control of GaN on Silicon(001) with EpiCurve<sup>®</sup> TT during HEMT growth

The challenges of GaN growth on Si(111), especially for LED growth, are well known and meanwhile controllable. Cooldown-assisted layer cracking as a result of high tensile stress can be prevented and crystal quality can be enhanced by sophisticated interlayers. Numerous institutions worldwide are already using LayTec's EpiCurve® TT with advanced curvature resolution for high quality GaN devices on large scale Silicon substrates.

Now, this experience is being transferred to growth on Si(001) and Si(110), because GaN based power electronics can be easily integrated with Si standard electronics (CMOS) and is available in large sizes up to 300 mm.

At the International Workshop on Nitride Semiconductors (IWN, Japan, October 2012), Jonas Hennig of Otto-von-Guericke Universität Magdeburg (Germany) reported about high performance of GaN HEMT structures on Si(001) with highly optimized interlayers to control stress and defect density [1]. According to Mr. Hennig, in-situ growth monitoring by Epi-Curve® TT is a great help for their strain engineering. Fig. 1 shows temperature (red) and advanced resolution curvature (black) measurements, Fig. 2 - reflectance measurements at



In-situ measurements of temperature (red) and curvature (black) by EpiCurve®TT during GaN on Si(001) growth.

# time (s)

In-situ reflectance measurements by EpiCurve®TT at three wavelengths: blue - 950 nm, red - 633 nm, black - 405 nm

three wavelengths. The well pronounced Fabry-Perot oscillations at 633 nm (red) and 950 nm (blue) in correlation with the smooth development of the curvature show the high quality of the GaN. Furthermore, during the growth of interlayers, when the temperature is being brought down, an abrubt increase of curvature can be observed (Fig. 1).

The three combined reflectance signals help to determine the growth rates and adjust the growth parameters. Additionally, the 405 nm reflectance (Fig. 2 - black) provides information on the structural interface quality.

The work at Otto-von-Guericke University and other institution which use LayTec's in-situ tools for Silicon applications shows that the quality of GaN/Si can be significantly improved by advanced curvature monitoring in combination with multiple wavelength reflectance. LayTec is proud to be a part of the technology transfer from Si(111) in LED growth to Si(001) and Si(110) in power electronics.

[1] J. Hennig et al., GaN/AIN/AlInN based HEMTs grown by MOVPE on Si (111) and Si (001), Otto-von-Guericke University, IWN, October 2012, Sapporo, Japan

