

Gen3 in-situ tools: advanced capabilities for UV LED processes

Starting with Q1/2016, LayTec will ship in-situ metrology tools (EpiTT, EpiCurve[®] TT and Pyro 400) as part of the new and modular Gen3 class. This 3rd generation of in-situ metrology offers a whole number of significant technology advances and is more flexible in customization to the needs of specific epitaxy processes. An important example of these improvements is our recent metrology progress for UV LED related MOCVD. Since 2010

LayTec has been working together with the Joint Lab GaN Optoelectronics of FBH (Berlin, Germany) and Technical University of Berlin (Group of Prof. M. Kneissl). Within the Zwanzig20 consortium "Advanced UV for Life", our research target is the next generation technology for UV-B and UV-C III-Nitride-based LEDs. Find more about our participation in research consortia at laytec.de/solutions/advanced-rd

Advanced 405 nm reflectance analysis (LayTec Metrology Workshop, ICNS 2015)

At the recent Metrology Workshop during ICNS 2015 in Beijing LayTec was happy to welcome more than 60 guests! Prof. Dabing Li of Chinese Academy of Sciences (CAS) reported about AlN buffer optimization for UV LED growth by means of the 405 nm reflectance (Fig. 1). Dr. Ding Li (FBH) presented in-situ data of surface morphology during GaN growth on Ga₂O₃. Christoph Berger (Otto von Guericke University Magdeburg, Germany) held a talk on compensation of Ge-doping memory effects in III-nitride processes, i.e. in highly doped GaN/GaN:Ge DBRs using 405 nm reflectance. This technique is also of high importance for avoiding Ga carry-over (memory) effects in AlGaIn/AlN structures of UV LEDs.

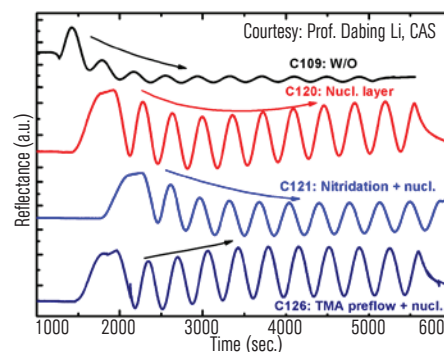


Fig 1: In-situ reflectance (405 nm) data measured by EpiTT during high temperature MOCVD growth of AlN buffers for UV LEDs. Different surface morphology modes (2D and 3D) show up:

- C109: 3D
- C120: 3D → 2D
- C121: 3D → 3D+2D
- C126: 2D

Find more about Prof. Dabing Li's talk at laytec.de/UVLED and *CrystEngComm*, **15** (2013) 6066.

EpiTT Gen3: high temperature AlN templates for UV LEDs

In the course of LayTec's cooperation with FBH in the consortium "Advanced UV for Life", FBH scientists (Group of Prof. Markus Weyers) have developed a high temperature (HT) MOCVD process for growing low-defect-density AlN/sapphire templates for UV LEDs. The split of the UV LED growth in two separate steps in two different MOCVD systems fully avoids the possible memory effect related interference of AlGaIn processes with the growth of high quality AlN

buffers. This UV LED buffer growth (Fig. 2) is monitored by 3 wavelength reflectance improved for very thick AlN/AlGaIn layer stacks and by the emissivity corrected high temperature sensing of EpiTT Gen3. The blue curve is the result of the quantitative analysis of the 3 wavelength reflectance measured by EpiTT Gen3. The thickness of the AlN nucleation layer is determined from the fitting curves (red) to be 43.2±0.2 nm, and the AlN HT buffer layer thickness to be 524.2±0.5 nm. The consistency of the used HT nk database is also obvious from the good agreement of the simulated curve segments in the temperature up-ramping and down-cooling steps.

The key for the unrivaled EpiTT Gen3 HT performance is not just the widened temperature sensing range, but, which is more important, also the HT nk database (up to 1500°C) for the AlN and AlGaIn class of materials and improved performance for double-side polished sapphire wafers. For further information please visit laytec.de/EpiTT

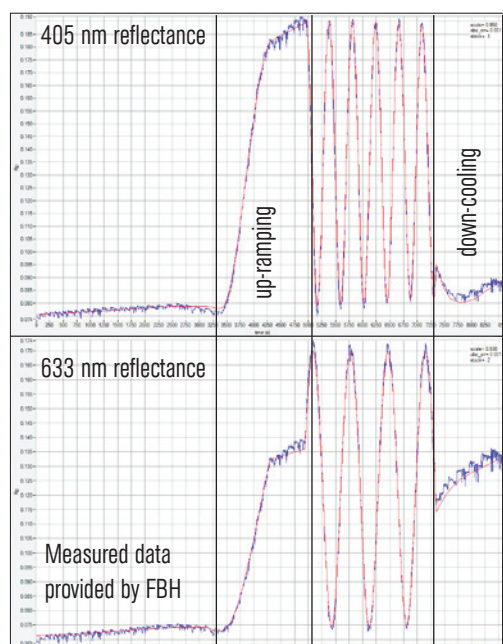


Fig 2: Two step growth of an AlN template structure for UV LEDs monitored by EpiTT Gen3 during AlN growth run in a modified HT Aixtron G3 Planetary reactor (950 nm reflectance is not shown here).

You can meet us at the following workshops, conferences and trade fairs:

- 2-4 Nov 2015 | **SSL China 2015** | Shenzhen, China | Invited talk: Integrated metrology – latest progress for enabling advanced manufacturing of III-Nitride based LEDs (visible and UV) and Lasers
- 8-13 Nov 2015 | **ISGN-6** | Hamamatsu, Japan | Booth F3-7
- 13-18 Feb 2016 | **SPIE Photonics West 2016** | San Francisco, CA, USA | Talk: "Process control of MOCVD growth for LEDs and other devices"