

EpiTT FaceT – comprehensive process control of laser facet passivation in MBE

In the January edition of our [newsletter](#) (01/2020) we reported on **EpiTT FaceT**, a temperature metrology system specifically designed for improving the yield of facet coating processes in large production MBEs for high-power GaAs-based lasers. This time we share the latest data on the EpiTT FaceT's comprehensive performance: beyond facet temperature sensing in the range between room temperature and 400°C we added the real-time in-

situ thickness sensing of the nanometer-scaled ZnSe facet coating layers. Fig. 1a shows the increase of ZnSe thickness (d) on the facets as measured with a resolution better than 0.5nm by short-wavelength reflectance during the MBE process. Fig. 1b demonstrates the response of facet temperature to heat transfer from the MBE sources during coating. This comprehensive and precise process control is vital for preventing catastrophic optical damage (COD) in the laser devices.

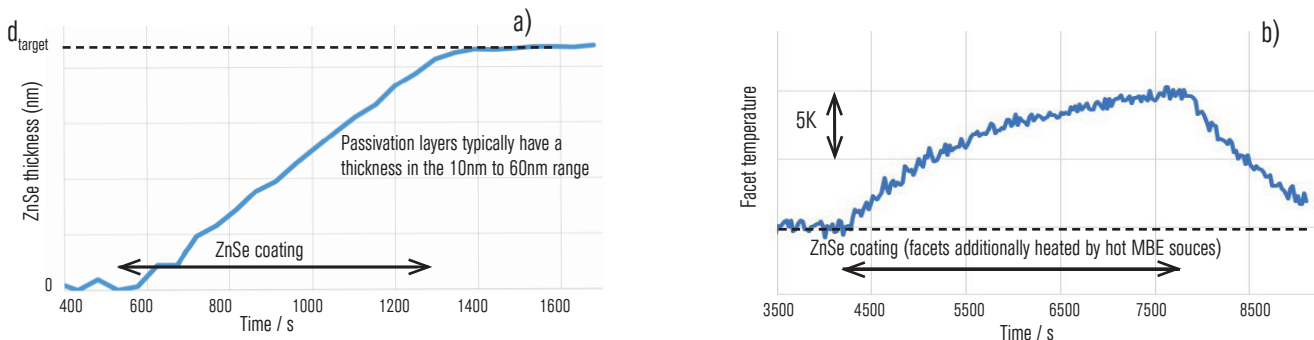


Fig. 1 Monitoring ZnSe facet coating on a stack of GaAs-based edge emitting lasers

EpiTT Band Edge – ZnO substrate temperature and growth rate control in MBE

The group of Prof. C. Meier at the University of Paderborn focusses on modern methods of nanofabrication and nanotechnology with the aim of developing novel devices for photonics, plasmonics and nonlinear processes. In a recent project they grow Zinc oxide (ZnO) structures in MBE both by homoepitaxy on ZnO substrates and by heteroepitaxy on sapphire and silicon. LayTec supports this research with a newly developed version of its EpiTT Band Edge that combines long-wavelength (1550nm) pyrometry with short-wavelength ZnO band-edge temperature sensing as well as with 405nm in-situ reflectance. While temperature sensing

on silicon substrates and growth rate measurements during growth of ZnMnO/ZnO heterostructures are covered by the EpiTT's standard performance, Fig.2 shows the outstanding performance of EpiTT Band Edge even during ZnO/ZnO homoepitaxy: the temperature of the ZnO substrate is measured throughout the process by the integrated Band Edge temperature module and 405nm reflectance gives access to homo-epitaxial growth rate. At this wavelength, located close to the ZnO band edge, the tiny ($\pm 0.5\%$) Fabry-Perot oscillations of ZnO grown on ZnO (with different doping levels) can be resolved.

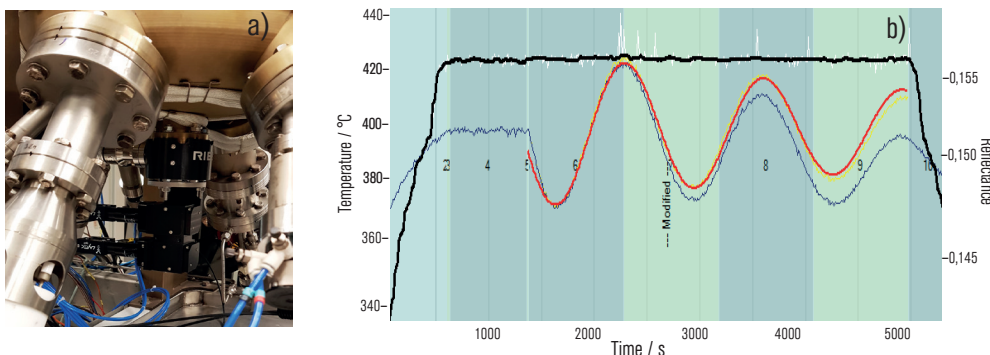


Fig. 2 EpiTT Band Edge for oxide semiconductor MBE: a) the optical head as mounted at the RIBER C12 MBE system and b) example in-situ data – ZnO substrate temperature (black line) and 405nm reflectance (blue line). After surface roughening effects have been numerically removed (yellow line) the best fit (red line) yields a growth rate of 0.078nm/s.

Since 2001 we annually offer to our customers the 'LayTec in-situ seminar' as a traditional satellite workshop at one of the international conferences. Despite the Corona pandemic, this year too we do not want to miss the opportunity for lively exchange with the epitaxy community. Therefore, we "invented" a new format for our seminar to take place between August 24-25 2020: In Berlin we will hold twin-sessions in the morning (for our European and Asian customers) and in the afternoon (for our European and American customers) where ours and your contributed talks will be presented in a combined real-life and globally transmitted web-based event. Please, stay tuned for more information from LayTec marketing and R&D and send us your short abstracts for presentations. For more information, please visit laytec.de