LAYTEC

MEMBER OF THE NYNOMIC GROUP

vol #2

EpiNet®'s "Algorithm Deep-Dive" series

Learn how to analyze your in-situ data most efficiently

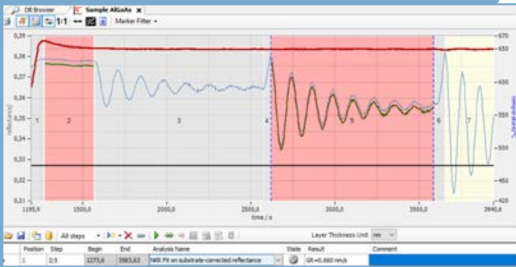

Fig. 1: Analysis screen of EpiNet® applying the "NKR on substrate-corrected reflectance" allowing for simultaneous fitting of the refractive index n, the extinction coefficient k and the growth rate r for analyzing materials like AlGaAs on top of a known substrate (here: GaAs). Note that the fit was exclusively applied to the process step marked in red.

Fig. 2: Property grid displaying the values for the thickness (D; in nm), the extinction coefficient (K; dimensionless), the refractive index (N; dimensionless) and the growth rate (R; in nm/s). Additionally, the known substrate material is selected in the lower section.

Algorithm profile

Algo name: NKR Fit on substrate/calibration-layer-corrected reflectance

Short description:

- Analysis method for thick (>1 oscillation period visible) smooth layers of all (even unknown) materials.
- No optical properties need to be known for the analysed layer.
- Additional knowledge about underlying substrate and/or layer can be used to ensure correct reflectance values as starting values for the fitting of the layer of interest.
- Allows for simultaneous fitting of reflectance transients obtained by LayTec's EpiCurve® TT and EpiTT to deduce the refractive index n, the extinction coefficient k and the growth rate r during epitaxial growth of virtually all materials (e.g. AlGaAs).
- Conducts reflectance correction by applying a correction factor for the reflectance calibration value Alpha using the knowledge of the optical properties from the underlying material.
- Can either relate to the substrate ("NKR Fit on substrate") or on a previously deposited layer of known material ("calibration-layer-corrected reflectance").
- Correction factor is fitted first, then the reflectance transient is corrected before the common NKR fit is executed.

Usage ideas and alternatives:

- The algorithm is particularly helpful, if a slightly false reflectance calibration is suspected or to compensate changes in the optical path (e.g. increasing window deposition or deforming of the viewport).

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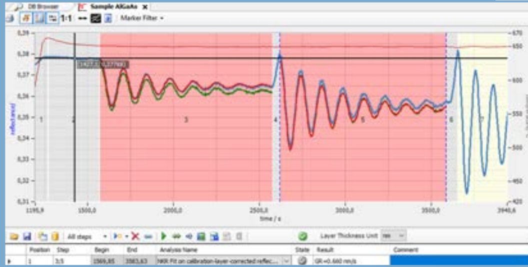

Fig. 3: Analysis screen of EpiNet® applying the "NKR on calibration-layer-corrected reflectance" allowing for simultaneous fitting of the refractive index n, the extinction coefficient k and the growth rate r for analyzing materials like AlGaAs on top of a known underlying layer (here: AlGaAs). Note that the fit was exclusively applied to the process step marked in red.

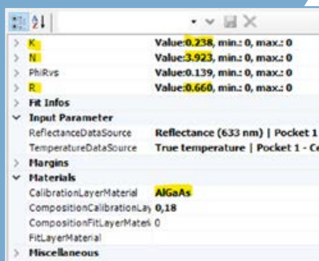

Fig. 4: Property grid displaying the values for the thickness (D; in nm), the extinction coefficient (K; dimensionless), the refractive index (N; dimensionless) and the growth rate (R; in nm/s). Additionally, the known layer material and its composition is selected in the lower section.

Algorithm profile

Algo name: NKR Fit on substrate/calibration-layer-corrected reflectance

Additional use cases are similar to the "NKR adv virtual layer fit":

- Analysis for thick smooth layers like e.g. contact layers, buffer layers, etc.
- Use this analysis to gain temperature dependent n and k data for unknown materials by fixing the growth rate with thickness information about the layer from ex-situ measurements (e.g. XRD).
- For known materials, the multi-wavelength fits offer a faster and more precise analysis (to be covered in future volume of this series).

User instructions can be found in the manual and can be obtained via info@laytec.de.

Reference data is available within EpiNet®.

Follow us on LinkedIn to see the latest editions of our Algorithm Deep-Dive Series there first!

www.laytec.de