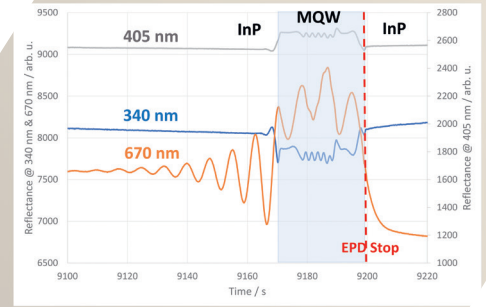




TRlton®

Reflectance based optical multiwavelength in-situ metrology for endpoint detection

Applications

- › In-situ metrology for plasma etch monitoring and endpoint detection
- › Suitable for a wide range of processes (e.g. ALE, RIE, ICP) and applicable to variety of material systems (e.g. GaN, InP, GaAs, metal)
- › Compatible with e.g. Oxford Instrument Plasma Technology, SENTECH Instruments, SAMCO etchers
- › Control on nm-scale of remaining barrier thickness in gate region of transistors, e.g. MIS-HEFT
- › Etch stop with nm-accuracy in manufacturing of III-V lasers, e.g. InP telecom transmitter and GaAs high power lasers diodes
- › Extraction of thin film properties
- › Statistical process control of dry etch processes

Features

- › Reflectance based integrated metrology system for in-situ monitoring equipped with its own GUI
- › Three wavelength operation from UV (340 nm), visible (405 nm) to infrared (670 nm or 950 nm)
- › Simultaneous etch rate monitoring of mask and semiconductor, measurement of selectivity
- › Etch depth measurement with accuracy better than 0.1 %
- › Detection of thin film interfaces
- › User friendly recipe editor enabling easy implementation of endpoint detection (EPD) algorithm
- › Simulation software for modeling of etch transient of a layer stack



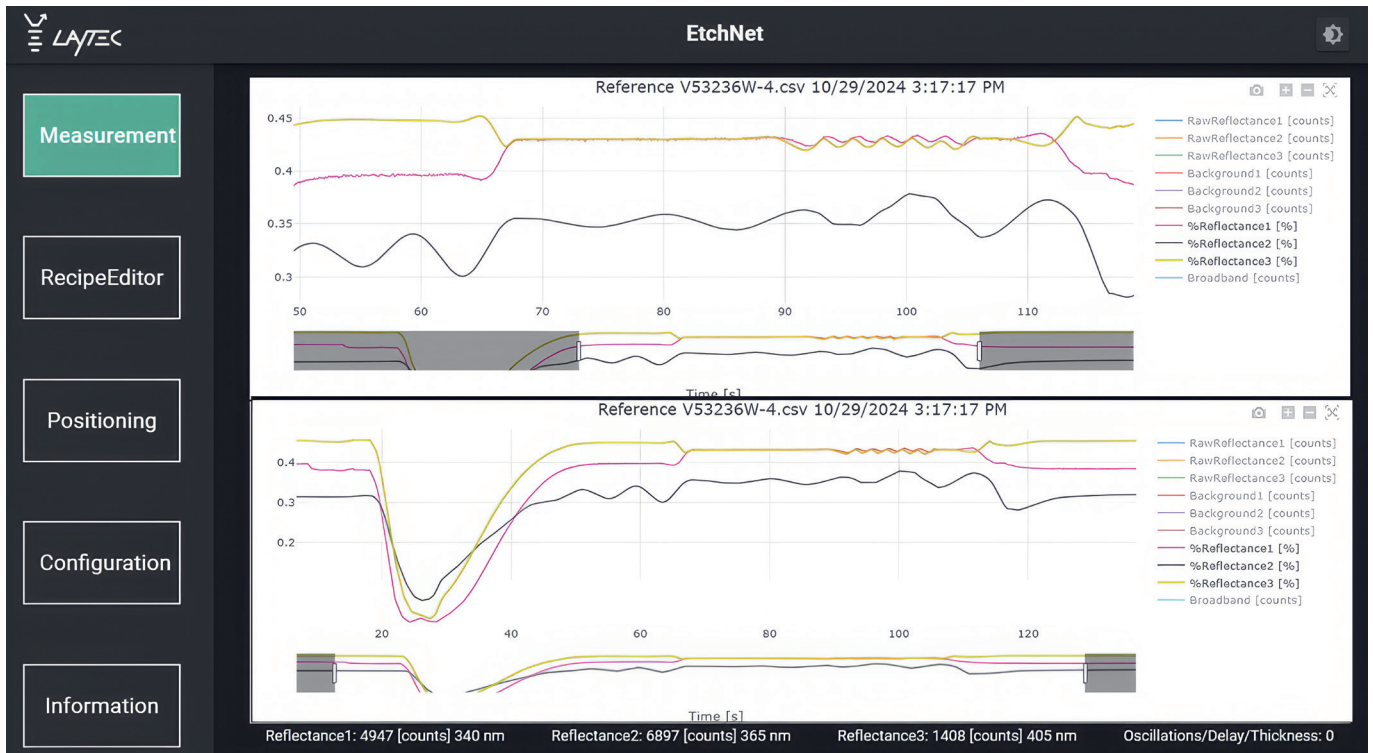
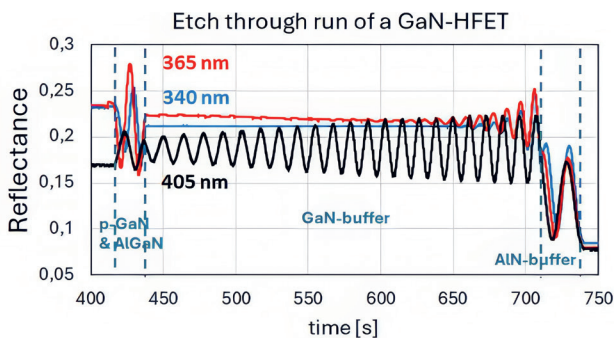
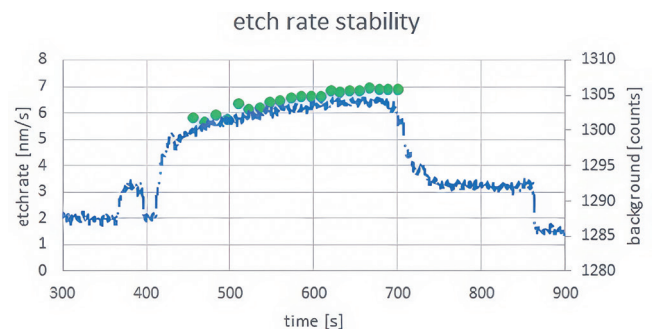


Figure 1: Snapshot of an etch transient recorded with TRItion during plasma etch monitoring. The grey curve represents reflectance at 670 nm, which shows FPO in quaternary and InP layers thinner than ~700 nm, enabling real-time etch rate extraction. The yellow-green curve depicts the reflectance etch transient at 405 nm, showing a sharp change that facilitates real-time detection of binary/quaternary interfaces.



Etch transient of an etch through run recorded by TRItion® during plasma etching of a GaN-HFET. FPO are clearly visible at 405 nm (black curve) throughout the entire structure, while at the shorter wavelengths 340 nm and 365 nm, strongly damped FPO are seen near thin film interfaces.



In-situ diagnostic derived from TRItion® data during ICP etch of GaN HFET (left figure). The red data points show real time etch rate stability (left Y-axis) versus time (X-axis) during an etch recipe is extracted from temporal evolution of lengths of consecutive FPO at 405 nm. The blue data points show the background in counts over time of the signal at 405 nm.

Process requirements

- Top view port in etch chamber; perpendicular view on the sample
- Communication interface to enable automatic endpoint detection