

ORS

APPLICATION NOTES

Quantifying roughness

Advantage of *in situ* roughness monitoring

- ∞ This is essential during GaN growth, as the process of growing GaN involves the initial formation of three-dimensional islands that are observed as layer roughness.

In order to achieve good quality, two-dimensional GaN layers, you first form three-dimensional islands that are observed by *in situ* monitoring as surface roughness. As the amount of GaN that is deposited increases, these three-dimensional islands expand and coalesce to form a two-dimensional film. The level of roughness is related to the size and distribution of the GaN islands and it is their size and distribution that is critical to the quality of the final GaN film.

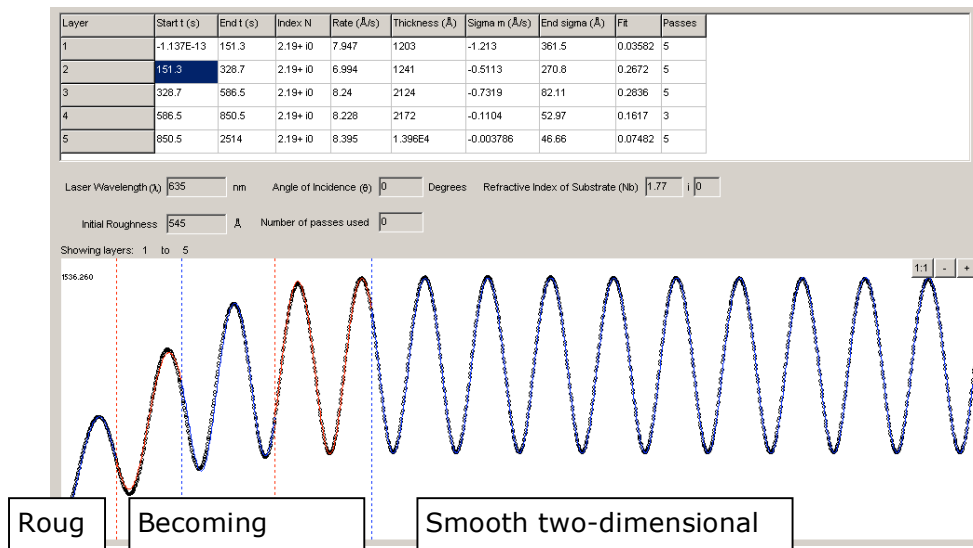


Figure 1: An interferogram from a GaN on sapphire

During the nucleation layer, the surface roughens. As more GaN is deposited, the surface morphology recovers and the surface becomes smooth.

In this analysis, the initial roughness was calculated to be 545Å which corresponds to an *in situ* F_{rs} value of 1.01. After 6740Å (.6µm) of GaN had been deposited, the surface became smooth with a surface roughness = 46Å, the *in situ* F_{rs} value now equalling 0.00743. This is depicted in Figure 3, which shows the reduction in F_{rs} throughout the GaN growth until a smooth surface is achieved.

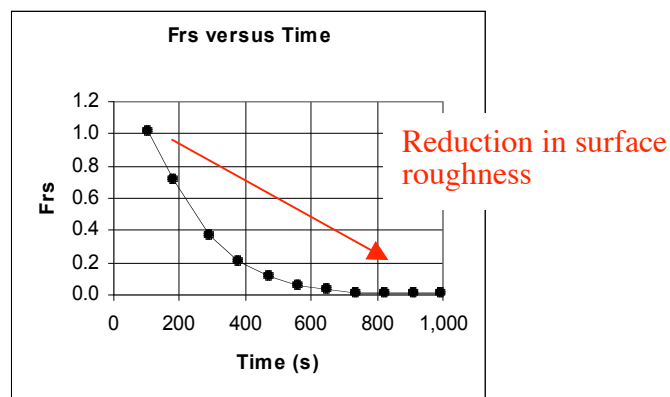


Figure 2: The reduction in F_{rs} (*in situ* roughness) as a function of time during the growth of .6µm of GaN