GaN on Sapphire Templates

(Undoped, n-type, p-type, and high resistive Zn-compensated)

Process Performance

General Product Specification

GaN
Sapphire

Available GaN templates on sapphire:

Sapphire Substrate Size (single-size polished, c-plane)	2″, 3″, 4″ *(See note 1)*
GaN orientation	(0001) *(See note 2)*
GaN Thickness Range	5 μm to 1 mm
Dopant & Carrier Concentration (cm^{-3})	• Undoped : < 5x 10^{16} • n-type (Si-doped) : (1 to 3) x10^{18} • p-type (Mg-doped) : 1x10^{17} to 3x10^{18} • i-type (Zn-compensated) : N/A

Typical template properties for 5-μm thick GaN layer on 2-inch sapphire substrate:

Properties	*Specifications*
GaN Thickness	5 μm
Thickness Variation	<4% std. deviation
Thickness Uniformity	< 2% std. deviation
Bowing	< 50 μm
Dislocation Density (cm^{-2})	5 to 7 x 10^{8}
FWHM of X-ray ω-scan (0002), arcsec	< 400
Surface Morphology	As grown (typical ave. RMS < 3nm)
Doping	Undoped
Carrier Concentration (cm^{-3})	< 5x 0^{16}

Note:
1. *6-inch sapphire templates are available upon request.*
2. *Also available on double side polished sapphire; on R-plane and A-plane sapphire. Other GaN crystal orientations are available. Please consult TDI sales representative for details.*

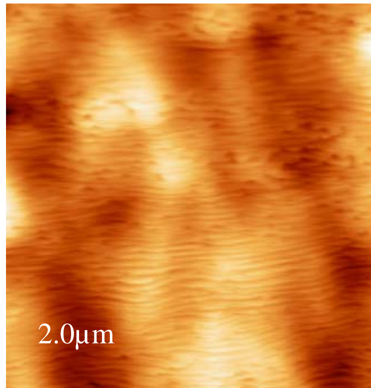
© Oxford Instruments Plasma Technology Ltd, 2008. All rights reserved. Ref: HV1-1/2008/Aug/LL

GaN on Sapphire Templates

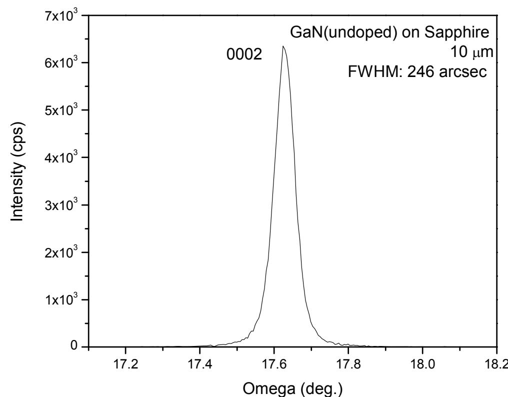
(Undoped, n-type, p-type, and high resistive Zn-compensated)

Process Performance

Atomic smooth surface of 10-µm thick GaN on sapphire with roughness RMS 0.9 nm



High crystalline quality with low dislocation density – FWHM of 250 arcsec (ω scan @ 00.2 Peak)



References:

(1) **Novel HVPE Technology to Grow Nanometer Thick GaN, AlN, AlGaN Layers and Multi-layered Structures.** Alexander Usikov, Lisa Shapovalova, Oleg Kovalenkov, Vitali Soukhoveev, Anna Volkova, Vladimir Ivantsov, Vladimir Dmitriev, Fanyu Meng, Ranjan Datta, Subhash Mahajan, Eric Readinger, Gregory Garret, Michael Wraback, and Michael Reshchikov. *Phys.Stat.Sol.* **(c) 4**, Issue 7, (2007) 2301-2305.

(2) **Electrical and Optical Properties of Thick Highly Doped P-Type GaN Layers Grown by HVPE,** A. Usikov, O. Kovalenkov, V. Soukhoveev, V. Ivantsov, A. Syrkin, V. Dmitriev, A. Yu. Nikiforov, S. G. Sundaresan, S. J. Jeliazkov, A. V. Davydov. Physica Status Solidi (c) No.6, 1829-1831(2008)

- **Plasma Etch & Deposition**
- **Atomic Layer Deposition**
- **Ion Beam Etch & Deposition**
- **Nanoscale Growth Systems**
- **Hydride Vapour Phase Epitaxy**

Technologies Devices International
Tel: +1 (301) 572-7834
Fax: +1 (301) 572-6435
Email: plasma@oxinst.com

Oxford Instruments Plasma Technology

UK
Tel: +44 (0)1934 837000
Fax: +44 (0)1934 837001
Email: plasma @oxinst.com

Germany
Wiesbaden
Tel: +49 (0)6122 937 161
Fax: +49 (0)6122 937 175

Japan
Tokyo
Tel: +81 3 5245 3261
Fax: +81 3 5245 4466

P.R. China
Beijing
Tel: +86 10 6518 8160/1/2
Fax: +86 10 6518 8155

Shanghai
Tel: +86 21 6360 8530
Fax: +86 21 6360 8535

Singapore
Tel: +65 6337 6848
Fax: +65 6337 6286

www.oxford-instruments.com

© Oxford Instruments Plasma Technology Ltd, 2008. All rights reserved. Ref: HV1-1/2008/Aug/LL