

AlN template on Sapphire for Deep UV LED

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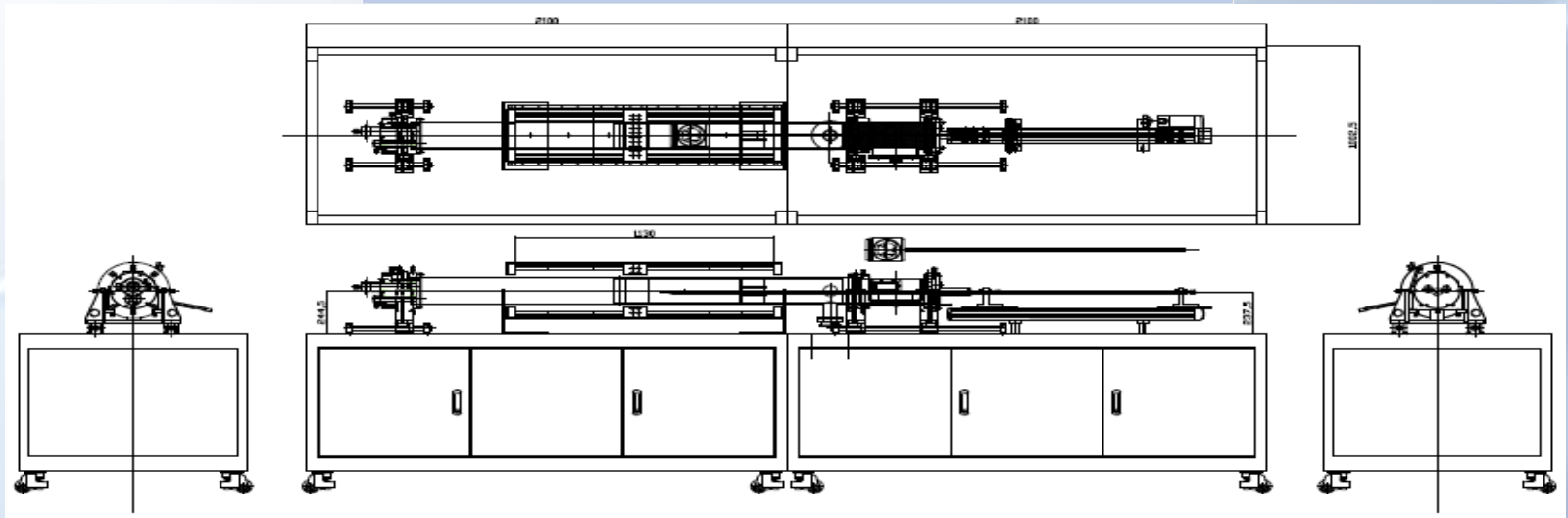
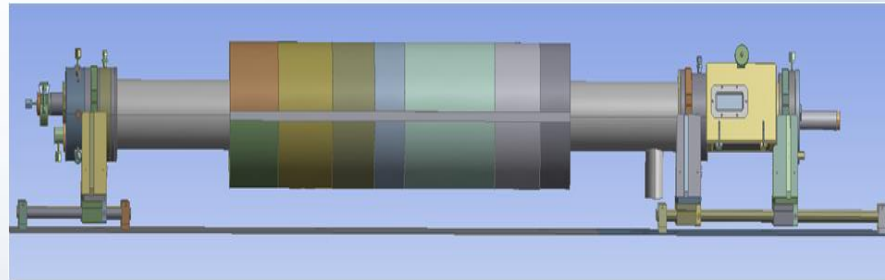
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LumiGNtech Co., Ltd.

❖ Growth Method : HVPE

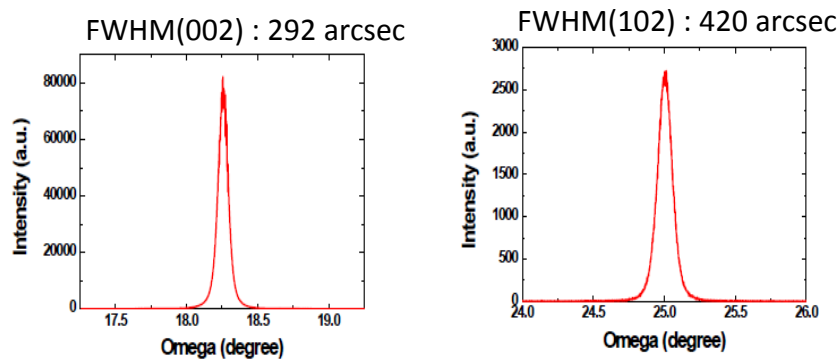
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- ◆ Hydride Vapor Phase Epitaxy : 3 pcs x 2 inch wafer (Usually Sapphire)
- ◆ Maximum growth temperature : **1150°C**
- ◆ Crack free AlN layer thickness : typical $\sim 2.0\mu\text{m}$ (maximum $\sim 3.0\mu\text{m}$)



- ◆ FWHM of X-ray Rocking Curve , Optical transmission at Deep UV Range
- ◆ Surface morphology : **Should be improved for Epi-Ready**

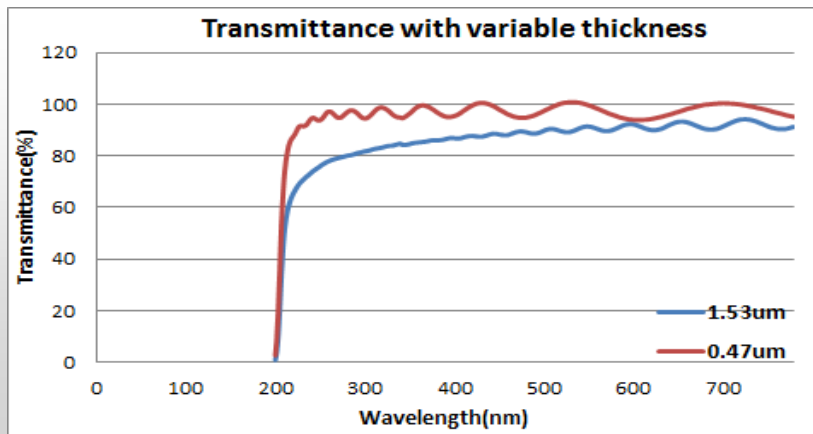
- FWHM of X-ray rocking curve



AlN(002) X-ray rocking curve

AlN(102) X-ray rocking curve

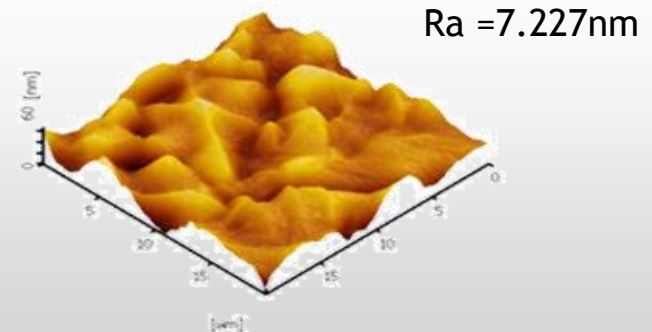
- Optical Transmission



- Surface morphology by OM(X200)



- Surface morphology by AFM (20x20μm)



◆ Epi-Ready surface by introduction of Chemical Mechanical Polishing Process

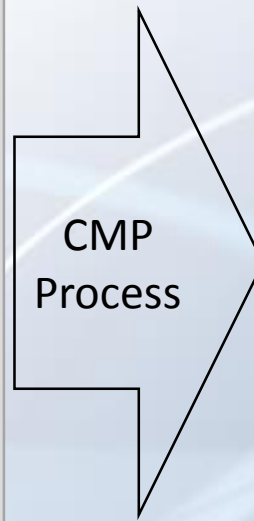
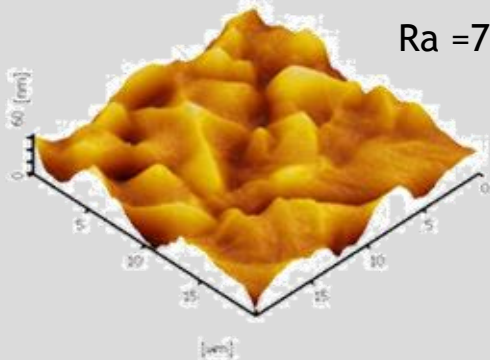
As Grown surface

- Surface morphology by OM(X200)



- Surface morphology by AFM (20x20μm)

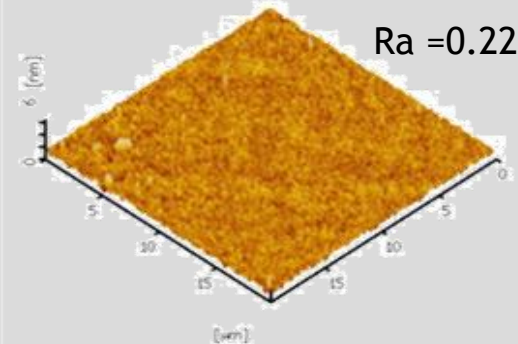
Ra =7.227nm



After CMP surface



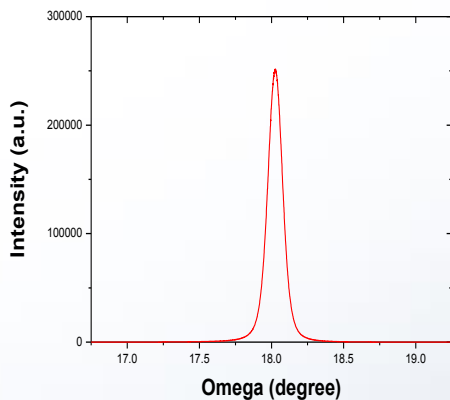
Ra =0.223nm



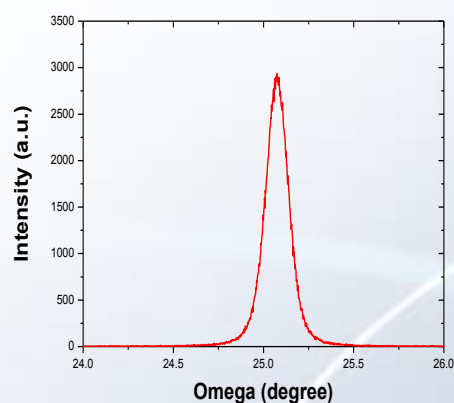
◆ AlN on Cylindrical PSS

- FWHM of X-ray rocking curve

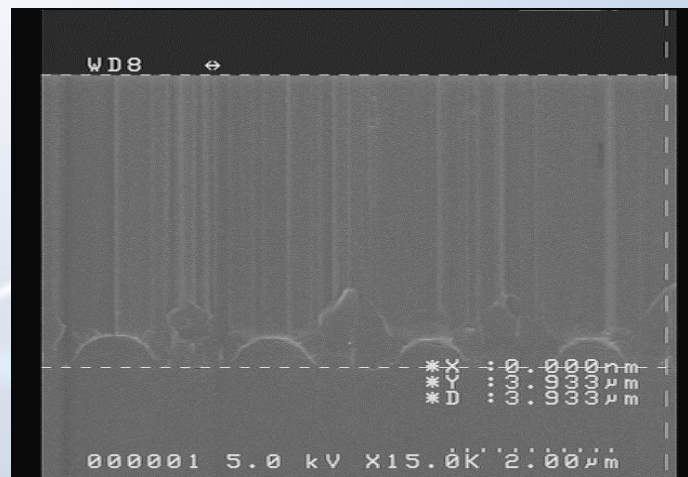
FWHM(002) : 428 arcsec



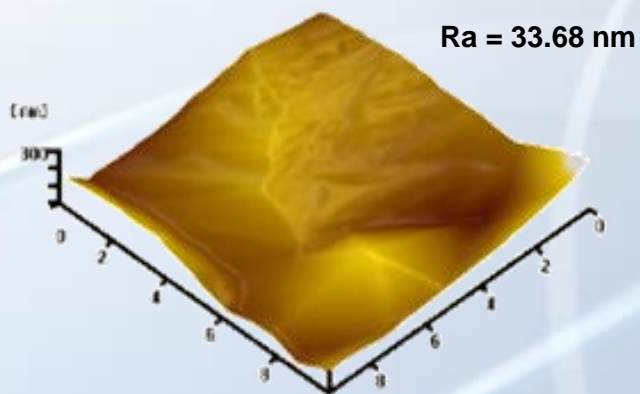
FWHM(102) : 530 arcsec



- View of Cross-Section

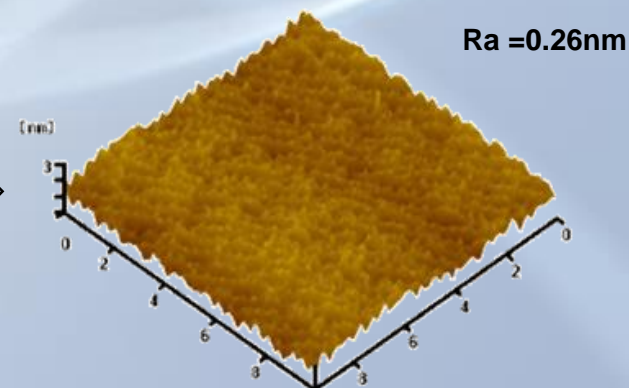


- Surface morphology by AFM (20x20μm)



As Grown surface

CMP Process

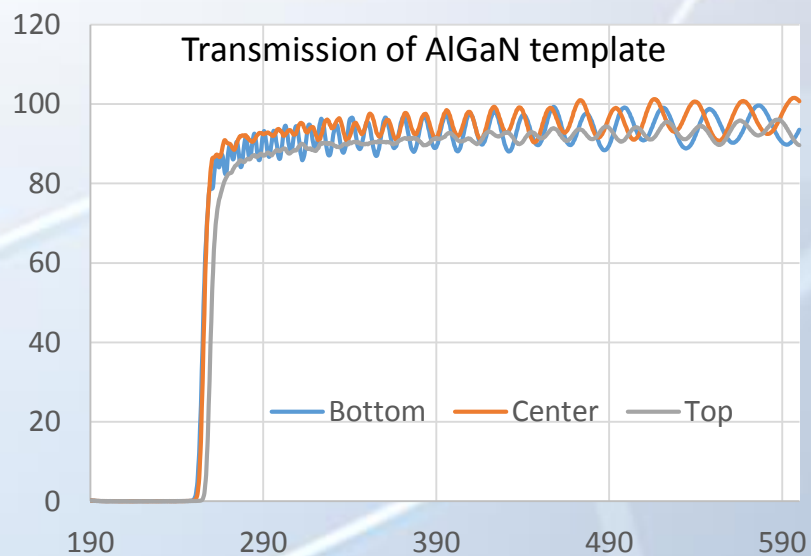
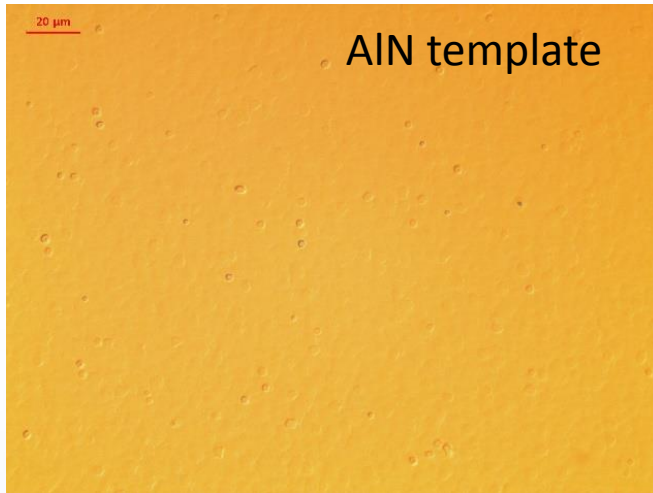


After CMP surface

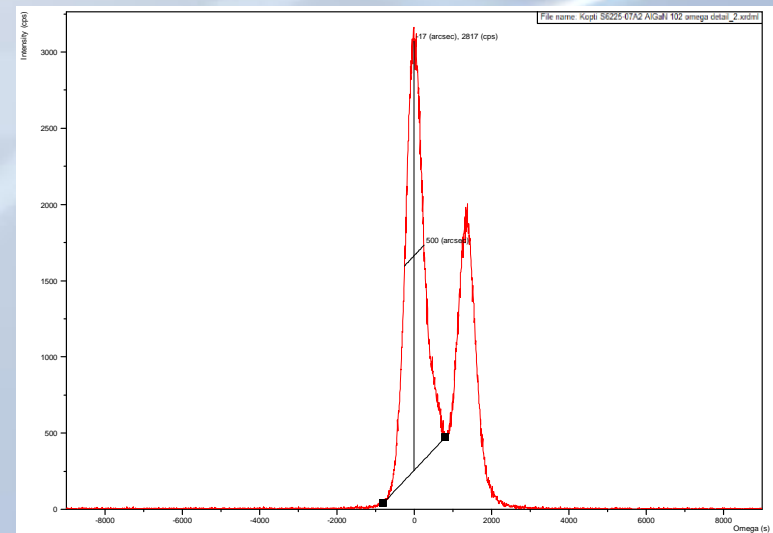
❖ AlGaN Regrowth on AlN template

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◆ AlGaN(Al: 50%) on AlN template by conventional MOCVD (Veecon D300)



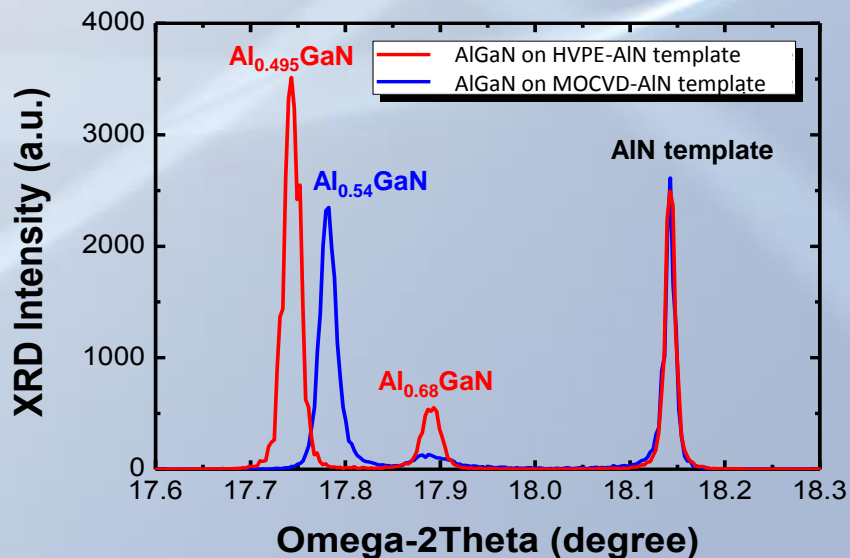
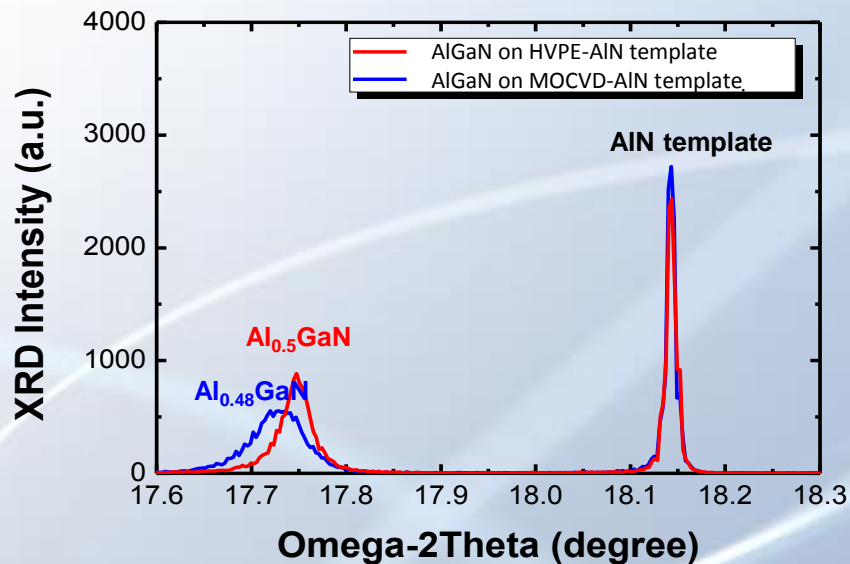
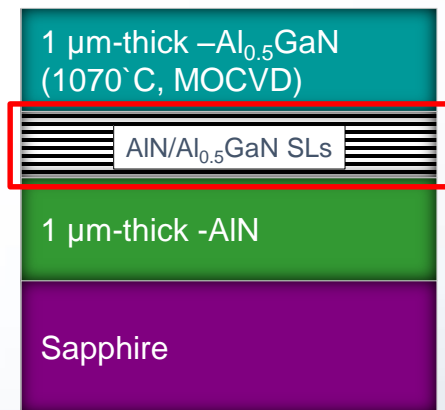
FWHM(102) of AlGaN layer : 500 arcsec



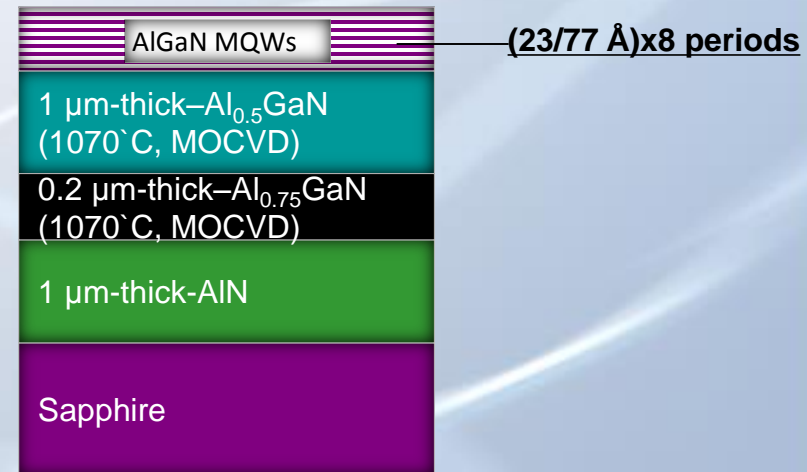
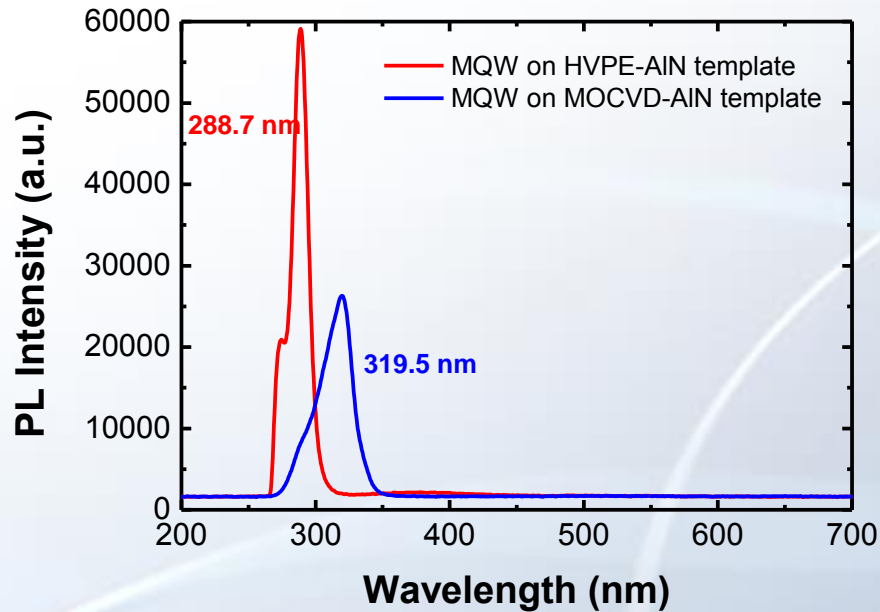
❖ AlGaN on AlN template (HVPE vs MOCVD)

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◆ XRD of AlGaN (Al: 50%) on AlN template (HVPE vs MOCVD)

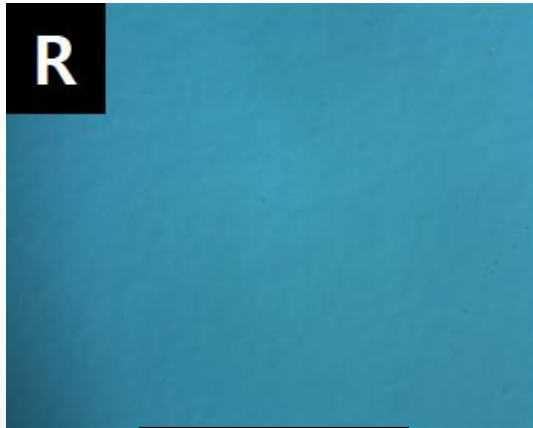


◆ MQW on AlN template (HVPE vs MOCVD) : Strain Effect ?



◆ UV LED EPI Regrowth on Lumi's AlN template

- Surface morphology by OM(X200)



UV-C epi
Growth



- Vf of 275 nm UV LED epi-wafer

