

High Functional Nano-sensors and Nano-materials

High-quality GaN-based semiconductor

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Objective

1. Establishment of heteroepitaxial growth of high-quality AlGaIn/GaN heterostructure on sapphire.
2. Development of MOCVD system for uniform heterostructure on 4-inch size substrate.
3. Development of ultraviolet (UV) sensor using wide-band gap AlGaIn.

Results

AlGaIn/GaN heterostructure on 4-inch size sapphire **Patent submitting**

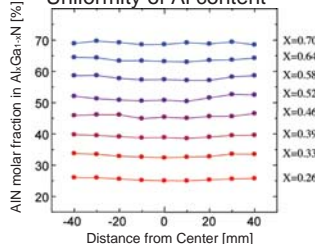
Surface morphology



Structure

i-Al _x Ga _{1-x} N 0.2 μm
i-GaN 2 μm
Buffer layer
C-face Sapphire sub.

Uniformity of Al content



Feature

1. High-quality and good uniformity
2. AlGaIn with high Al content

Development of MOCVD system for GaN-based materials



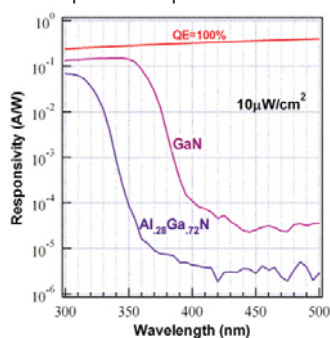
Feature

Growth of high-quality GaN-based materials on large-size substrate

Industrial applications

GaN-based UV sensor

Spectral response



Material	Cut-off wavelength (nm)	Sensitivity (mA/W)	Quantum efficiency (%)
GaN	~360	150	54
Al _{0.28} Ga _{0.72} N	~310	65	26

Feature

1. Sensitive to UV
2. Low dark current (@-5V)
AlGaIn: 8.3×10^{-10} A/cm²
3. Operation at high temperature
4. Application to UV sensor

Demonstration of UV sensor for flame detection (Bias=0V)

