

Robust planarization technique for III-nitride materials

Introduction

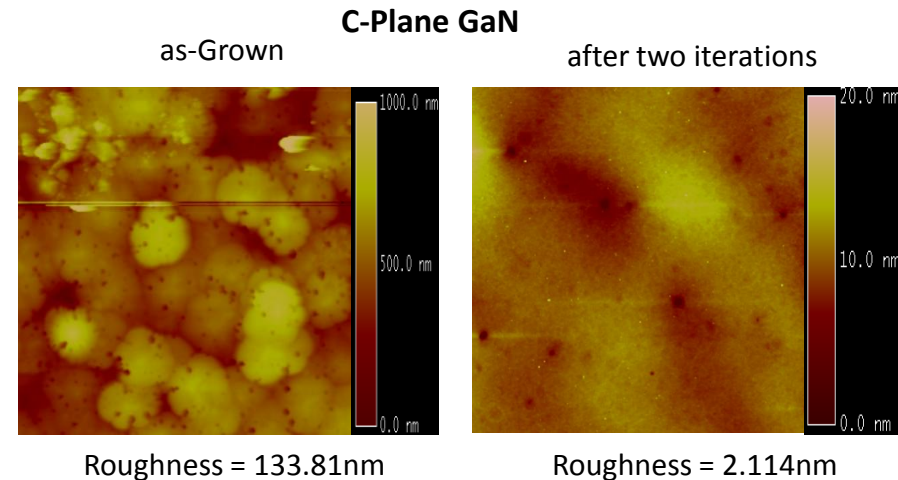
- The formation of GaN, AlN, InN and AlGaIn wafers from ingots leads to rough surfaces due to sawing. Control and precision in surface and interface engineering becomes increasingly critical in III-nitride compound device processing as more demanding applications of optoelectronics and high-speed devices emerge. This requires increasing demands on smooth surface topography

Description

- This invention constitutes a method for planarization of III-nitride substrates and films, making them epi-ready
- The method involves applying a photoresist layer and reactive ion etching

Value Proposition

- The method enables a 99% roughness reduction, enabling a roughness of up to 1nm, without subsurface damage
- It can be used to planarize a wider range of III-nitride semiconductors (e.g. independent of crystallographic orientation and thin films) than feasible with alternative methods



Dimensions of these AFM images are 50 μ m*50 μ m

Applications:

- Semiconductor devices such as transistors, LEDs, lasers, MEMS, solar cells, etc.

Benefits:

- The method contains elements which are well accepted in the semiconductor industry for planarization of dielectric layers
- Process is scalable and reproducible
- Applicable to thin films and many III-nitride materials
- Independent of polarity and crystallographic direction
- Compared to a chemo mechanical polish method this method does not result in scratched surfaces.

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Status

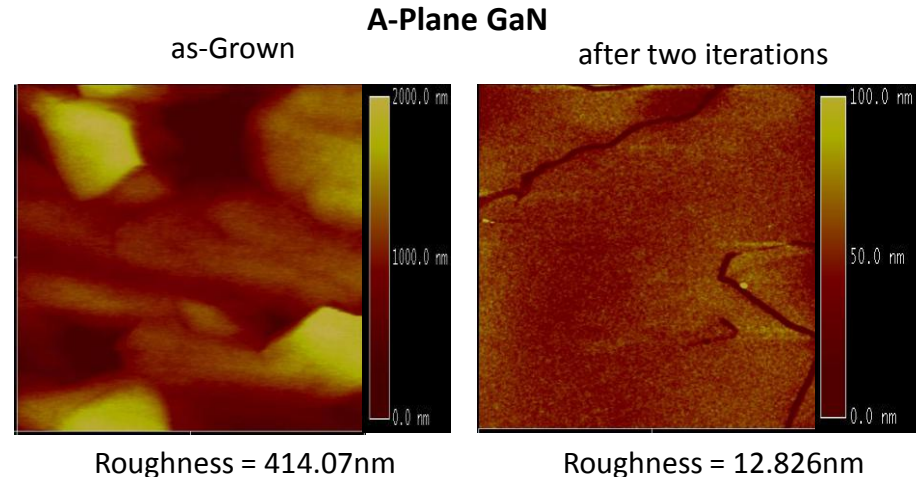
- Prototype and proof of principle of the equipment set-up available
- Samples of treated semiconductor film available upon request

Next Steps

- Development of dedicated coating and plasma etching device
- BU is looking for a commercial partner for co-development or licensing the intellectual property

Intellectual property:

- Patents
 - US20090236693
- Proprietary know-how
 - Method of spin deposition
 - Selection of appropriate photoresists
 - Suitable ICP etching conditions



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On-line sources of information:

- <http://people.bu.edu/tmd/>
- <http://www.wipo.int/pctdb/en/wo.jsp?WO=2007145679>