Studies of Initial Growth of GaN on InN Buffer Layers

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Background/Relevance

- III-Nitride materials, such as GaN and InN, have recently attracted much attention for applications in microelectronics and optoelectronics.
- New devices may be realized using GaN growth on InN, however, attempts to make high quality interfaces have had limited success.
- Growth and formation of this interface needs to be improved.

Innovation

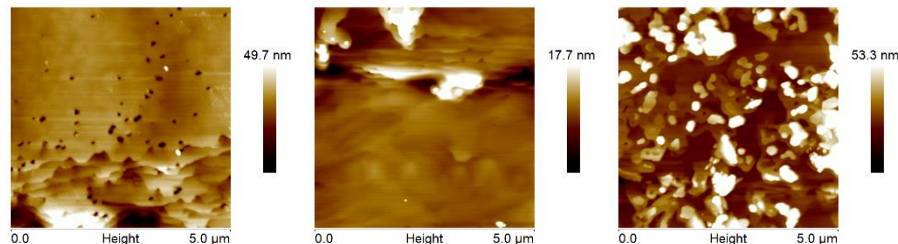
- GaN/InN MBE growth with different growth conditions and different GaN thicknesses; studying the quality of the grown samples by AFM, XRD, SEM, PL, EDX, and Raman.

Approach

- Studying and optimizing the surface of GaN grown on InN.
- Growing different structures with variable growth temperature.
- Growing different GaN layer thickness by molecular beam epitaxy (MBE).
- Performing the structural characterization by AFM, XRD, SEM, PL, EDX and Raman.

Key Results

- AFM images of InN layers grown on GaN/sapphire substrate.
- The growth condition is 400 ˚C with thickness of 1000 nm.
- AFM image of GaN layer after the growth with thickness of 50 nm grown at high temperature.



Conclusions

- Growing a 10 nm GaN at low temperature and then growing a 50 nm GaN at high temperature on InN layer did not prevent the evaporation of InN layer at high temperature.
- GaN on InN was successfully grown at 400 C˚, and InGaN alloys was found between the two layers. However, the surface of GaN was very rough at this low temperature growth.

Future Work

- TEM needs to be done to investigate the quality and structure of the interface. Also, a variety of low temperature growths of GaN to enhance the surface morphology and structure quality are needed.