

## **Formation of air-gap structure at a GaN epilayer/substrate interface by using an InN interlayer**

### **Abstract**

We propose a new technique for "air-gap" formation at a GaN/sapphire interface by using an InN interlayer. This is aimed to grow epitaxial GaN films with reduced stress and cracks. First, an InN interlayer of about 0.2  $\mu\text{m}$  thick is grown at 600  $^{\circ}\text{C}$  in atmospheric pressure. Then a 30 nm-thick GaN buffer layer is grown on the InN layer at 550  $^{\circ}\text{C}$ . The substrate temperature is ramped up to 1000  $^{\circ}\text{C}$  in the  $\text{NH}_3$  flow, and finally a 1.5  $\mu\text{m}$ -thick GaN epilayer is grown on the annealed GaN buffer layer using nitrogen carrier gas. Consequently, an "air-gap" structure is naturally formed close to the substrate surface. During the ramping period of substrate temperature, the InN layer decomposes due to its thermal instability and metallic In is formed. It is found that metallic In drops as a result of InN decomposition contribute to the air-gap formation. No cracks are found on the GaN surface and a reduced stress in the layer is confirmed by PL and Raman shift measurements.