

**Growth of AlN bulk crystals for AlGaN-based devices
(UV LEDs, lasers, sensors, and power electronics)**

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Wafers cut from aluminium nitride (AlN) bulk crystals are most promising substrates for devices based on high Al content AlGaN epitaxial layers, due to their chemical stability, low thermal and lattice mismatch, and compressive strain to AlGaN layers. While AlN substrates are now available commercially, serious technological challenges still prevent mass production of AlN substrates having an industrially relevant diameter and defect density at reasonable cost.

In this talk, we will present our status and progress in homoepitaxial AlN bulk crystal growth. AlN crystals are grown on N-polar basal plane AlN seeds prepared from spontaneously nucleated freestanding AlN crystals. The excellent crystal structural quality of the spontaneously nucleated AlN crystals is inherited in subsequent homoepitaxial bulk growth. In order to preserve the seed quality during bulk growth and to provide for single-crystalline diameter enlargement, seed backside evaporation, crystal cracking, and parasitic nucleation adjacent to the seed have to be prevented. These and other technological challenges are addressed in the presentation. Optical properties with corresponding impurity issues of the substrates are discussed. Finally, we show that proper surface preparation results in a smooth morphology of AlN layers grown by MOVPE on substrates sliced from the AlN crystals. Lasing of optically pumped AlGaN/AlN laser structures demonstrate the quality of the obtained substrates.