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Aluminum Nitride – From Crystal Growth to Device Development

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Message from the Guest Editors

Aluminum nitride (AlN) is an ideal material for a wide range of high-power and high-frequency applications (e.g., UV emitters and UV sensors in the wavelength range well below 200 nm, and for piezoelectric and temperature sensing at high temperatures) due to its outstanding electronic, mechanical and chemical properties (resistivity 10^{7}–10^{13} Wcm, band gap 6.2 eV, thermal conductivity 340 $Wm^{-1}K^{-1}$, thermal decomposition > 2400 °C, Mohs hardness 9).

To date, most applications of AlN have been based on the deposition of layers of nitride semiconductors by metal-organic chemical vapor deposition (MOCVD) on foreign substrates such as sapphire.

The use of AlN native substrates would bring dramatically better performance of the corresponding devices because of the reduction in defect density by orders of magnitude. The only known method to fabricate industrially relevant AlN single crystals is the PVT (sublimation/reconstruction) method at temperatures greater than 2000 °C. The associated problems, such as nucleation on native substrates, grain expansion, wafering or n-doping, are still the subject of intensive investigations.

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Message from the Editor-in-Chief

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