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In situ and *ex situ* optical characterization of nitride semiconductor crystal for advanced optical and power electronic devices

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More compact, lighter and long lifetime mobile devices and more environmental friendly power supplies are being developed by utilizing nitride semiconductors such as AlN, GaN, InN and their alloys. Together with high-efficiency InGaN blue light emitting diodes (LEDs), high-spec and long-lifetime portable devices and general lighting will play an important role in a sustainable modern 21st century society. AlGaN/GaN high electron mobility transistors have been used in new-generation mobile communication bases, delivering more data with lower consumption. Finally, ultraviolet LEDs are widely used for curing and germicidal disinfection. The potential of nitride semiconductors is not limited to these applications, but to achieve their potential, optics can help a lot. High-quality, high-indium-content InGaN is a prerequisite for long-wavelength visible emission from green to red. However, InGaN is difficult to grow with higher indium content because of the lattice parameters and growth conditions mismatch between GaN and InN. Indium fluctuation and strain relaxation introduced by morphological degradation are substantial challenges. In order to monitor crystal properties and surface evolution during growth, we used a three-wavelength laser beam scattering *in situ* monitoring system on a horizontal metalorganic vapor phase epitaxy reactor. For electronic devices, *ex situ* emission microscopy is a powerful tool for the analysis of critical defects on vertical GaN power electronic devices. The optical emission image of a biased device reflects leakage information and allows us to identify the properties of defects.

Biography

S Nitta obtained his PhD in 2003 from Meijo University, Japan. Since then, he has been developing MOVPE equipment and high-efficiency blue and white LEDs at companies. In 2015, he joined Nagoya University as a designated Associate Professor. His research is focused on the epitaxial and bulk crystal growth of nitride semiconductors and their applications to future optical and electronic devices.

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