【T-06】 분과초청

Successful Growth and Applications of High-Quality GaN and InGaN Nanorod Arrays

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Nanometer-sized III-Nitride nanorods are known to have great prospects in fundamental physical science andnovel nano-technological applications. For instance, because of the large bandgap and structural confinement of GaN nanorods, the fabrication of visible and UV optoelectronic devices with relatively low power consumption is potentially feasible. GaN nanorods were synthesized through a carbon-nanotube-confined reaction. Subsequently, GaN-carbon composite nanotubes and nanorods were produced by arc discharge in nitrogen atmosphere. Single-crystal GaN nanowires were formed by laser-assisted catalytic growth. Wirelike structures using polycrystalline indium powder as a catalyst were fabricated. GaN nanorods were grown by a sublimation of GaN powder under an ammonia flow. In a parallel effort, GaN nanowires in anodic alumina membranes were formed through gas-phase reaction of Ga_2O vapor with flowing NH_3. In addition, self-organized GaN nanocolumns on Al_2O_3 substrates were grown by rf-radical-source molecular-beam epitaxy. Three-dimensional GaN structures were prepared by direct reaction of Ga vapor with flowing NH_3 above 900℃.

Although GaN nanorods have been prepared a irregular type using transition metal nanoparticles such as Ni, Co, and Fe as a catalyst, carbon nanotubes as a template, no report of controllable regular array and straight shape preparation of GaN and InGaN nanorods has been made so far. For practical applications, high-density and well-ordered nanostructures will be needed.

Here, we describe a very simple method for controllable GaN and InGaN nanorods growth by hydride vapor phase epitaxy at a low temperature of around 480℃. Structural characterization of the GaN and InGaN nanorods by X-ray diffraction (XRD) and transmission electron microscopy (TEM) indicates that the nanorods are preferentially oriented in the *c*-axis

direction. Photoluminescence (PL) characteristics of the GaN and InGaN nanorods show a strong UV light emission peaking at around 358nm and a strong blue emission peaking at 466nm at room temperature, respectively.