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Group III-nitride semiconductor nanostructures for novel photonic applications

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Group III-nitride semiconductor nanostructures have attracted much attention due to their rich and unique optical properties and their versatile applications. Here, we present various nitride-based quantum nanostructures grown on pyramidal, annular, columnar, and tapered structures by using metal-organic chemical vapor deposition (MOCVD). First, we demonstrated multi-color and broadband visible light emitting diodes based on GaN hexagonal nano-pyramid and annular structures. Second, GaN-based rod structures were directly fabricated on Si substrates and then InGaN/GaN multiple quantum wells (QWs) were deposited on the surface of GaN rods. By using tapered GaN/InGaN core–shell QW semiconductor rods having a large gradient in their bandgap energy along their growth direction, highly asymmetric photonic diode behavior was observed. Finally, we demonstrate a novel approach of the self-aligned deterministic coupling of single quantum dots (QDs) to nanofocused plasmonic modes. Using this approach, we achieved strong spontaneous emission enhancement of QDs over a wide spectral range of ~150 meV.

Biography

Yong-Hoon Cho received his PhD degree in Solid State Physics from Seoul National University, Korea in 1997. He is currently the KAIST-Chair Professor, the Head of Department of Physics, the Director of KAIST Center for LED Research, and the Chief of Educational Program for LED. He has more than 229 refereed international publications and 310 international conferences presentations. He has served as a Editorial Board Member of *Scientific Reports*, Associate Editor of *IEEE Transactions on Nanotechnology,* and *Associate Editor of AAPPS Bulletin.*

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