Hydrothermally Grown ZnO Based Material For Solid State Lighting Applications

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ZnO has gained a great deal of interest as light emitting material. It has wide direct bandgap of 3.37 eV and large exciton binding energy of 60 meV. Various growth methods have been developed for ZnO epitaxial growth such as laser-assisted plasma enhanced chemical vapor deposition (PECVD), metal organic chemical vapor deposition (MOCVD), molecular beam epitaxy (MBE), and hydrothermal synthesis. Among them, hydrothermal growth is the cost-effective, environmentally friendly, and low temperature operating process compared to conventional MOCVD.
Nonpolar a-plane ZnO and CdZnO were successfully grown on a-plane GaN substrates by simple hydrothermal method at the low temperature of 90℃. Unlike growth on c-plane GaN, film type ZnO and CdZnO with high crystalline quality were obtained due to the anisotropic growth rates along the specific crystallographic directions. A-plane n-type ZnO/p-type GaN hybrid structure LED was fabricated, and the device shows sharp ultra-violet electroluminescence without any significant green and yellow emissions.