

Surface patterning of glass-type phosphor in light emitting diodes for light extraction

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Phosphor plate is essential to convert the blue light from GaN-based light-emitting diode (LED) into white light. Due to the high refractive index of phosphor plate, total internal reflection is occurred at the interfaces and it decreases the luminous efficiency of LED. In previous researches, light extraction with patterns on the GaN layer and sapphire substrate was introduced to reduce total internal reflection. Pattern on the active layer and/or electrodes offers additional escape route for the emitted light. In this study, we introduce periodic patterns on phosphor plate to improve the luminous efficiency. For this work, FDTD simulation was preceded to investigate proper dimension and configuration of pattern. Based on such simulation results, some kind of patterns were designed on the surface of phosphor plate by soft lithography technique. We searched the range of optimal scale of patterns and compared the luminous efficiency of patterned phosphor plate with bare one.