



















gratings are far more effective in light extraction improvement compared to their low-index counterpart. The optimized structures were integrated on GaAs based LEDs by using self-assembled AAO membranes as a template, which acts as an effective and low-cost alternative to lithographic fabrications. The LED device with the optimized high-index-contrast a-Si grating yielded a 27% improvement in emission intensity. The effects of different index contrasts were verified by comparing the performances of gratings made from a-Si and SiO<sub>2</sub>. Unlike the simulation results, the device with fabricated a-Si grating showed a Lambertian emission pattern, which is due to the non-ideality of the periodicity. By proper structure design and materials selection, these approaches could also provide a guideline for efficiency enhancement in nitride and organic based LEDs.

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