

## Vertically stacked RGB LEDs with optimized distributed Bragg reflectors: supplement

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# Vertically-Stacked RGB LEDs with Optimized Distributed Bragg Reflectors: supplemental document

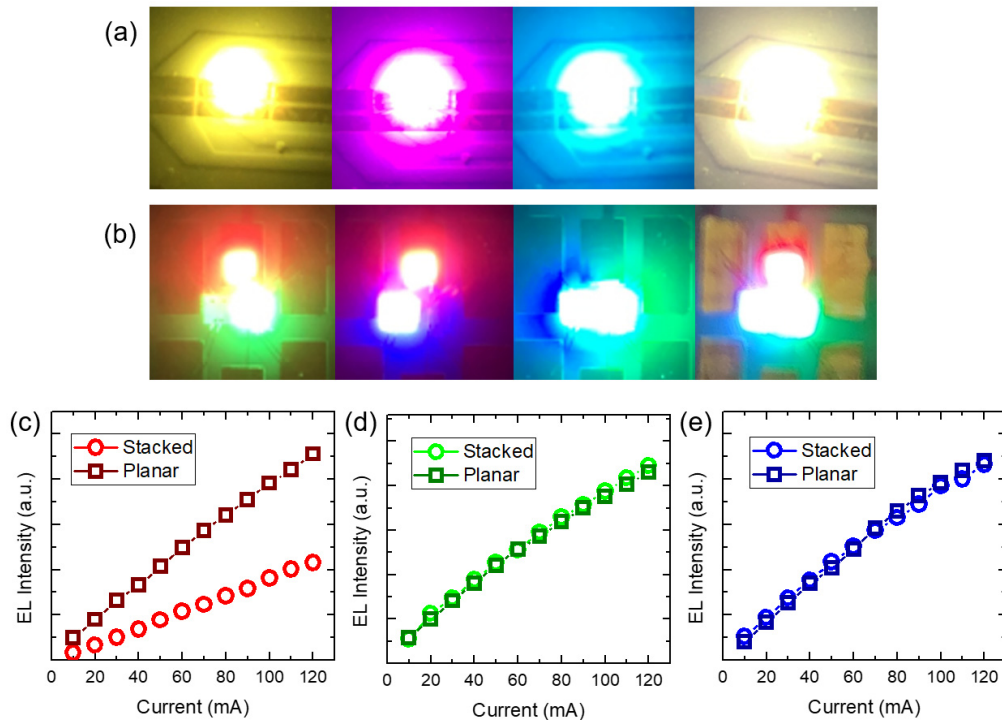


Figure S1 Optical microphotographs of the (a) vertically-stacked RGB LED and (b) planar RGB LED emitting different colors. L-I characteristics of (c) red, (d) green, and (e) blue LEDs in vertically-stacked and planar configurations.

Apart from the vertically-stacked RGB LEDs, a planar RGB LED is assembled using identical chips. Figures S1(a)-(b) shows the optical microphotographs of the devices emitting different colors. Although both devices can emit various colors by adjusting the injection currents of RGB LEDs, the uniformity of the emission color of the stacked device is much better than that of the planar device. Compared with LEDs assembled in a planar configuration, LEDs assembled in a stacked configuration experience greater optical loss and therefore the light intensities are expected to decrease [1]. As the red LED at bottom of the stack is most affected by absorption and reflection, the intensity of red light of vertically-stacked RGB LED is significantly lower than that of planar RGB LED, as shown in Fig. S1(c). As illustrated in Figs. S1(d)-(e), the intensities of blue and green light from the two devices are almost the same, owing to the selective reflectance of optimized DBRs.

## References

1. Y. F. Cheung and H. W. Choi, *IEEE T Electron Dev* **60**, 333-338 (2013).