can also optimize the fluorescent dye concentration and LC layer thickness to fine-tune the CCT for different applications. Other guest-host LC modes [30], such as vertical alignment, twisted nematic, or mixed-mode twisted nematic, can also be considered in our configuration.

5. Conclusion

We have demonstrated a real-time CCT-tunable WLED. The device configuration is quite simple where the key component is a color conversion film composed of dichroic fluorescent dye doped in liquid crystal. By adjusting the molecular reorientation of dichroic dyes, the intensity of the blue and red lights can be accurately manipulated, resulting in different CCT. In a proof-of-concept experiment, the CCT of a conventional phosphor-converted WLED can be tuned from 3200 K to 4100 K, while the operation voltage is less than 5 V. With further optimization, the tuning range could be enlarged to 2500 K with fairly good color performance: LER > 300 lm/W, CRI > 75, and Duv < 0.005. Also, good angular color uniformity is achieved with remote-phosphor coating. Different from other LC approaches, our device works well for an unpolarised white light source. Our design integrates two existing mature technologies together: LCD and LED. It holds promising applications for next generation smart lighting.

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