

CANDLELIGHTSTYLE ORGANIC LIGHT-EMITTING DIODE ENABLING BLUE HAZARD FREE LIGHTING

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Intense white light consisting of blue or violet emission might cause damage to human eyes, suppress melatonin-secretion, disrupt circadian rhythm and ecosystems, discolour artifacts, and pollute the night skies. Developing a blue hazard free lighting with high lightquality and energysaving character is highly demanding and challenging. So far, organic light-emitting diodes (OLEDs) have proven to be a great lighting measure that is friendly to human, environments and ecologies with energy-efficient and high-quality character besides being mercuryfree and having extremely high spectrum tailoring capability. In this study, the developed candlelight-style OLED consisting of multiple blackbody-radiation complementary organic emitters, namely sky-blue, green, yellow, and deep-red and provide a very-high spectrum resemblance index with respect to natural light, i.e. >90. Specifically, the resultant OLED showed a low colour temperature (<1,900 K), whose melatonin suppression sensitivity is only 3% relative to that of a 480 nm blue light. Its maximum retina permissible exposure limit is 3,454 seconds at 100 lx, 11, 10 and 6 times longer and safer than the counterparts of a compact fluorescent lamp (5,920 K), light emitting diode (5,500 K) and OLED (5,000 K). Additionally, its high device efficacy and long operation lifetime enable commercialization feasibility. The fabricated candlelight-style OLED can be an ideal lighting measure for indoor as well as outdoor illumination purpose due to its friendly nature to human and ecosystems.

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