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Human- and ecologically-friendly organic light-emitting diode

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Blue or violet emission included short wavelength lights impose tremendously high threat to human health, ecosystems, night sky and artifacts, etc. Minimizing the unwanted phototoxicity while maximizing the power efficiency and light-quality is highly challenging; but will soon become one of the focal points of the research and development in lighting technologies. Thanks to its extremely high spectrum tailoring flexibility, organic light- emitting diode (OLED) devices can be designed and fabricated with little violet and deep-blue emission to enable a human- and ecologically-friendly lighting with high efficiency and high light-quality. We found that energy-saving, quality and blue-hazard free, candlelight-style OLED can be made with the employment of multiple candlelight complementary organic emitters. The resultant orange-white light with a color temperature as low as that candles or oil lamps i.e. ~1,800-1,900K, is 90, 83 and 52 times safer in retina protection or 29, 20 and 12 times better for melatonin secretion compared to the cold-white light counterparts of compact fluorescent lamp (CFL), LED and OLED. Furthermore, it attracted very few insects after dusk as compared to the LEDs and incandescent bulb that emit deep-blue emission. Along with its high device efficacy and high spectrum resemblance index with respect to natural light, this candlelight OLED can be an ideal candidate for indoor as well as outdoor illumination measure due to its friendly nature to human and ecosystems.

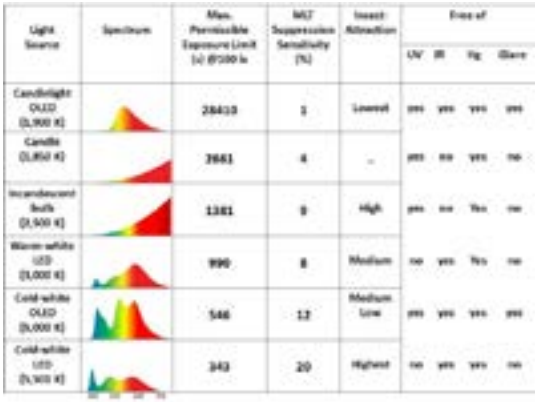

Figure1: Comparison of a candlelight-style OLED with current lightings in terms of maximum permissible exposure limit (s), melatonin suppression sensitivity (%), insect- attraction, and characteristics regarding ultraviolet (UV) and infrared (IR) emission, mercury (Hg) and glare.

Biography

Jwo-Huei Jou is a Professor of the Department of Materials Science and Engineering in National Tsinghua University, Taiwan and the President of the Chinese Organic Electronics Association. He received his PhD in Macromolecular Science and Engineering Program from University of Michigan in 1986. He joined IBM-Almaden Research Center USA as a Visiting Scientist from 1986-88. He has his expertise in high-efficiency Organic Light Emitting Diodes (OLEDs), polymer, thin film stress, and expert system applications. He is a pioneer of the natural light-style OLEDs, and has received a prestigious IDA lighting design award from the International Dark-Sky Association, USA for his candle light-style OLED invention.

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