

One-pot synthesize dispersible thermal stable organic downconversion materials under DBU catalyzation for high performance hybrid-LED lamps

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Table S 1 Target products yield of the reaction under different catalyst.

	Catalyst	Na ₂ CO ₃	K ₂ CO ₃	pyridine	triethylamine	DBU
Product	PER-G yield (%)	0	0	0	0	84
	PER-Y yield (%)	0	trace	0	0	74

All of the reactions were conducted using DMSO as solvent.

Table S 2 Some key physical properties of the ODMs and their solubility in different solvents.

	Wavelength of maximum absorption peak (nm)	Wavelength of maximum emission peak (nm)	Solubility in different solvents [#]				
			hexane	dichloromethane	Ethyl acetate	ethanol	methanol
		/relative quantum yield Φ_f (%) [*]					
PER-G	472	492/72	2	4	3	1	0
PER-Y	526	542/99	2	4	3	1	0
PER-R	547	578/97	4	4	4	0	0
DCPDI	515	543/100	1	1	1	0	0

* The absorption and fluorescence data were obtained from the diluted ethyl acetate solution (10^{-5} M). Quantum yields were obtained using relative method, in which N, N'-dicyclohexyl perylene-3, 4, 9, 10-tetracarboxydiimide was used as standard with 100% quantum yield, error $\pm 2\%$.^[2]

[#] Concentration of ODMs was obtained in different solvents. 0: insoluble; 1: less than 1 mg ml⁻¹; 2: 10-15 mg ml⁻¹; 3: 20-30 mg ml⁻¹; 4: >40 mg ml⁻¹.

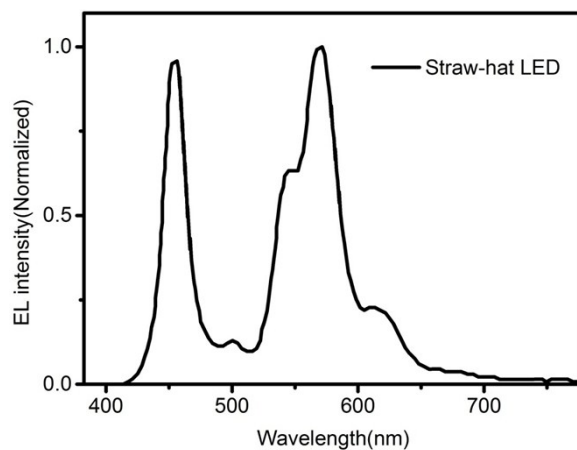


Figure S 1 The emission spectrum of a white straw-hat LED. Its chromaticity coordinates(x, y) are 0.357, 0.357 respectively.

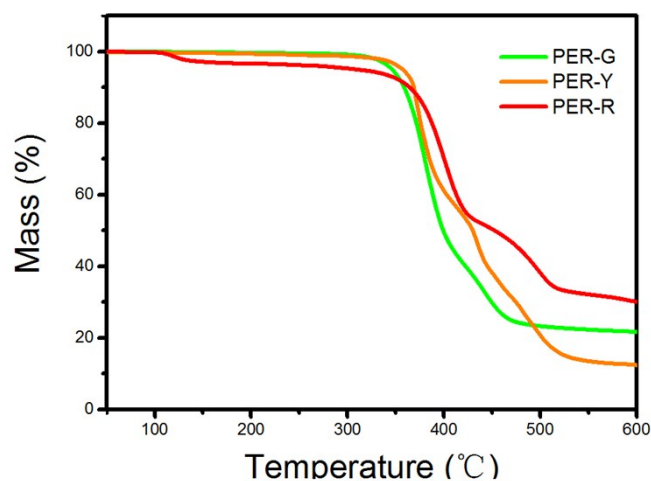


Figure S 2 TGA curves of the OMDs in this study. The heating rate was 10 °C and nitrogen was used as inert gas flow for all of them

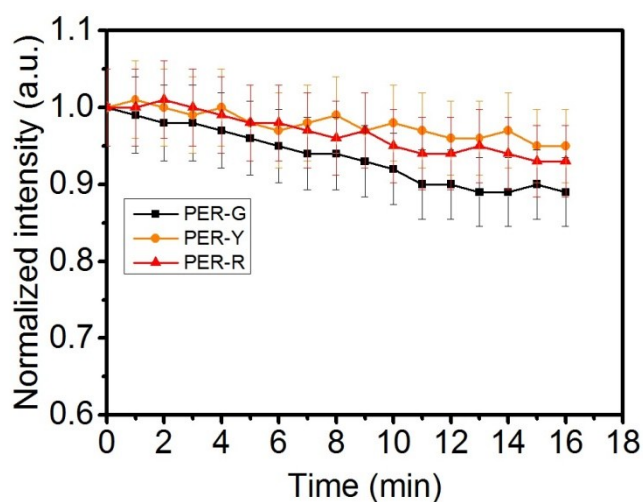


Figure S 3 Photoluminescent intensity of OMDs in melted polycarbonate in chamber of injection molding machine after different time.

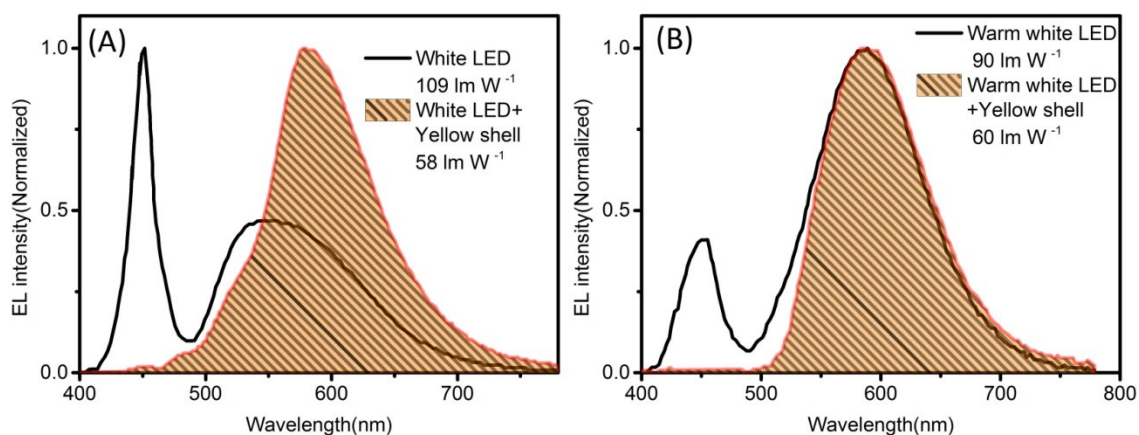


Figure S 4. Spectra of yellow lamp (filled area) made by the approach on the market filtering out blue light from a cold white LED array (A) and warm white LED array (B).

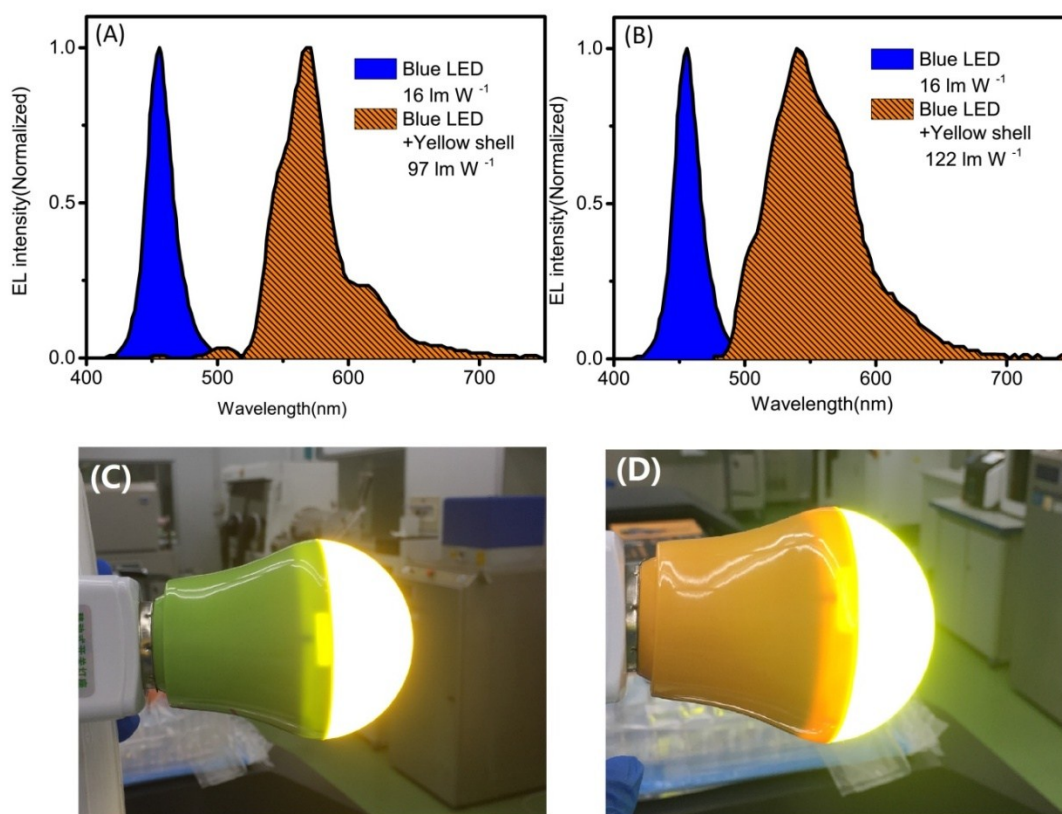


Figure S 5 Emission spectra before (blue) and after (brown) covering the blue LED array with a lampshade composed of (A) the proposed ODM and (B) different ODM composition. (C) and (D) show the related devices.

Reference

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- [2] a) M. Lin, Á. Jiméenez, C. Burschka, F. Würthner, *Chem. Commun.*, **2012**, *48*, 12050–12052; b) D. Ozdal, N. Aydinlik, J. Bodapati H. Icil, *Photochem. Photobiol. Sci.*, **2017**, *16*, 262-270; c) J. He, S. Li, and H. Zeng, *J. Heterocyclic Chem.* **2017**, *54*, 2800;