

## **Diluted PEDOT:PSS for high-performance organic light-emitting devices with thermally activated delayed fluorescence emitters**

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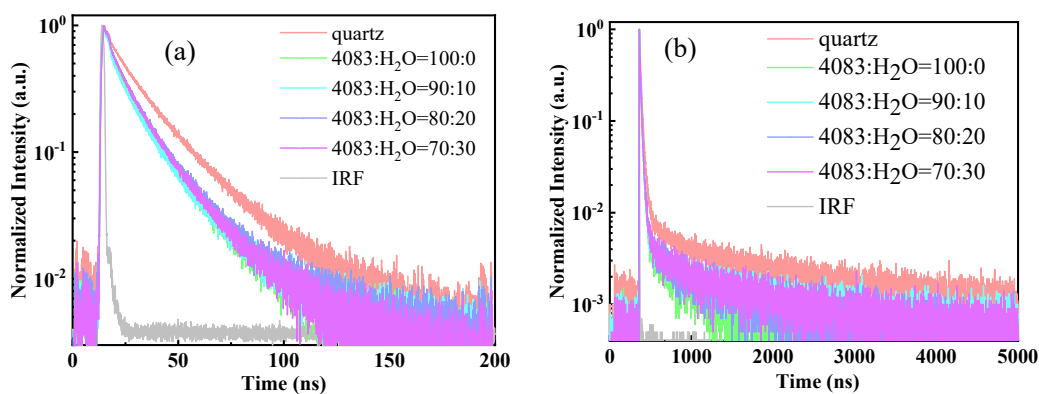
### **Materials**

The patterned ITO substrates were ordered from Shanxi Huaju Technology Co., Ltd. PEDOT:PSS-8000 (Clevios P VP CH 8000) and PEDOT:PSS-4083 (Clevios P VP Al 4083) were purchased from Heraeus. DMAC-DPS and 3SpiroAc-TB were synthesized in our lab according to the literatures. DPEPO, TmPyPB, and Liq were purchased from Shanghai Xinrunsheng Technology Co., Ltd. and used as received.

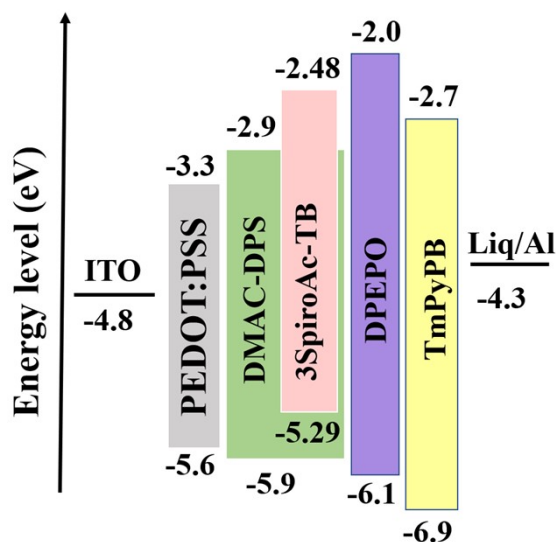
### **Experimental Section**

The pre-patterned ITO was cleaned with acetone and ethanol in an ultrasonic bath for 10 min, consecutively and then dried with a nitrogen gun before UV-ozone treatment for 20 min. A layer of PEDOT:PSS mixed with different proportion of deionized water was spin-coated on the ITO substrate at 4000 rpm for 30 s, and then annealed at 120 °C for 10 min in the glovebox. The emitting layer composed of DMAC-DPS:3SpiroAc-TB = 50:50 (wt./wt.) was directly spin-coated on PEDOT:PSS, and then annealed at 50

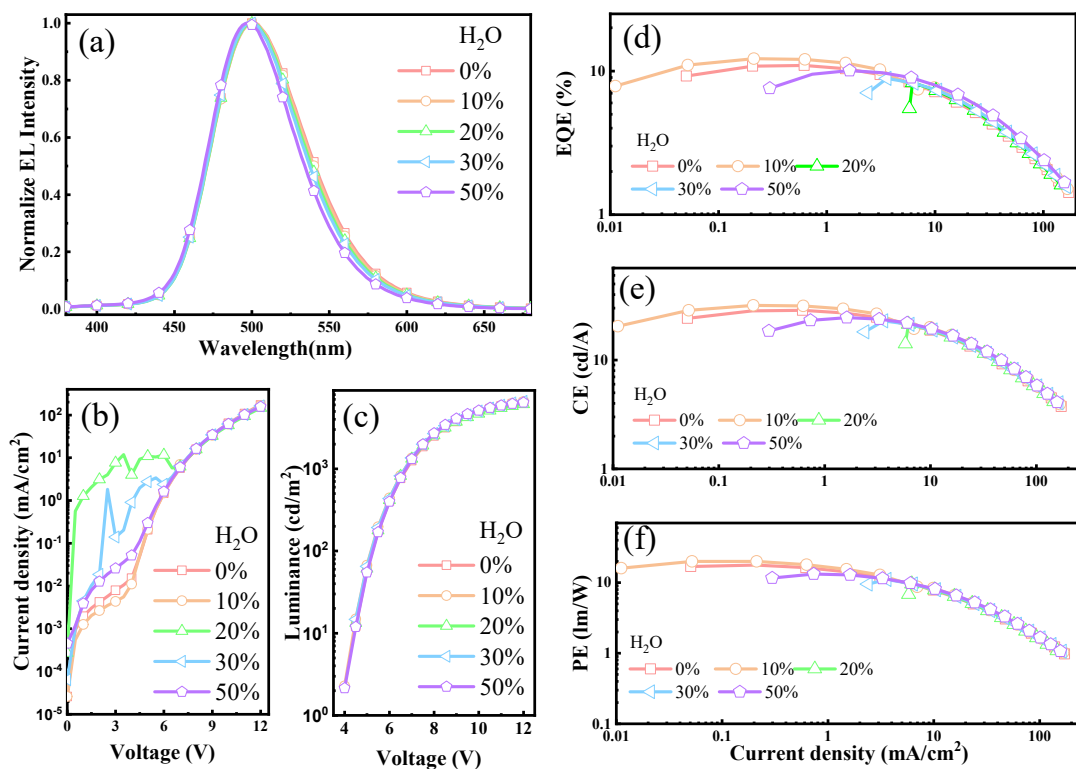
°C for 10 min. After loading the samples into the vacuum chamber, the hole-blocking layer (DPEPO), the electron transport layer (TmPyPB), the electron injection layer (Liq), and cathode Al were evaporated respectively at a pressure of  $10^{-6}$  mbar. Finally, the devices were encapsulated with the UV-curable epoxy in the glovebox before measured at the ambient air. The electroluminescent properties of the devices were measured by a PR735 SpectraScan Spectroradiometer (PhotoResearch), combined with a Keithley 2400 source meter unit. The transient photoluminescent decays were recorded with an Edinburgh FLS920 spectrofluorometer.



**Figure S1.** Transient PL decays of the emitting layer spin-coated on the different PEDOT:PSS-4083 substrates: (a) prompt and (b) delayed fluorescence.



**Figure S2.** Schematical diagram of the energy level alignment of the devices



**Figure S3.** (a) Normalized EL spectra of the devices with PEDOT:PSS-4083 diluted with different amount of H<sub>2</sub>O. (b) Current density-voltage curves, (c) luminance-voltage curves, (d) external quantum efficiency (EQE) versus current density curves, (e) current efficiency (CE) versus current density curves, and (f) Power efficiency (PE) versus current density curves of the devices.

**Table S1.** Summary of the EL data of the devices with PEDOT:PSS-4083 diluted with H<sub>2</sub>O.

4083:H <sub>2</sub> O (v./v.)	$\lambda_{\text{peak}}$ (nm)	EQE <sub>max</sub> (%)	CE <sub>max</sub> (cd/A)	PE <sub>max</sub> (lm/W)	Luminance (cd/m <sup>2</sup> )
100:0	500	9.4	24.6	12.9	6429
90:10	500	12.2	31.7	19.9	6578
80:20	500	8.3	21.4	9.6	6482
70:30	500	8.9	22.9	11.1	6608
50:50	498	10.1	24.6	12.9	6406