Supplementary Information:

Microfluidic White Organic Light-Emitting Diode Based on Integrated Patterns of Greenish-Blue and Yellow Solvent-Free Liquid Emitters

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Effect of the microchannel widths for a yellow liquid emitter on EL spectra of microfluidic white organic light-emitting diodes

We investigated the effects of the microchannel widths for TBRb-doped PLQ on the white EL emissions of the microfluidic WOLED. Three types of the electro-microfluidic devices (Devices 1, 2, and 3) were fabricated by photolithography and heterogeneous bonding through the use of APTES- and GOPTS-SAMs, as shown in Table S1. All devices have the same microchannel width for PLQ. A greenish-blue liquid emitter PLQ and a yellow liquid emitter 2wt% TBRb-doped PLQ were alternately injected from the inlets into the 6-μm-thick microchannels sandwiched between GOPTS-modified ITO anode and APTES-modified ITO cathode.

Table S1 Microchannel widths of the yellow and greenish-blue liquid emitters in the electro-microfluidic devices.

Sample	Yellow microchannel width (μm)	Greenish-blue microchannel width (μm)
Device 1	60	60
Device 2	40	60
Device 3	30	60

Figure S1 shows electroluminescence (EL) spectra from the devices 1, 2, and 3 at an applied voltage of 100 V. It was found that yellow components increased with increasing the microchannel widths for TBRb-doped PLQ. This suggests that our microfluidic WOLED can simply produce several white emissions by varying the channel-width ratios between PLQ and TBRb-doped PLQ.

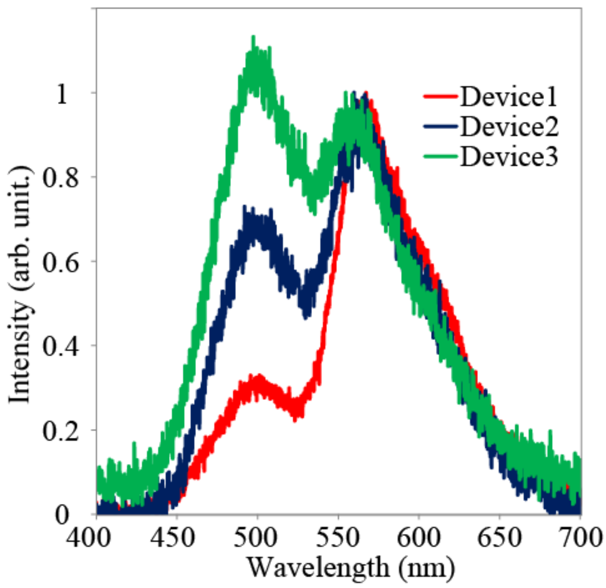

Figure S1 EL spectra of the microfluidic WOLED device varying the channel-width ratio between PLQ and TBRb-doped PLQ under an applied voltage of 100 V.

Various color electroluminescence emission of the integrated microfluidic organic light-emitting diode

We evaluated the electro-microfluidic device, which consists of the integrated 60-μm-wide microchannels, with combination of greenish-blue and red liquid emitters. Tetraphenyldibenzoperiflanthene (DBP)-doped PLQ were prepared as the red liquid emitter in accordance with the color tuning method reported in our previous works [S1]. PLQ and 0.4wt% DBP-doped PLQ were alternately injected from the inlets into the 60-μm-wide microchannels. Figure S2 shows a photograph of EL emission from the fabricated integrated microfluidic OLED with greenish-blue and red liquid emitters at an applied voltage of 70 V. It can be seen that purple emission was produced, indicating that the greenish-blue and red emissions were simultaneously generated at the emitting area of the electro-microfluidic device. We expect that our integrated electro-microfluidic device is also effective for generating full-color EL emissions via numerous combinations of liquid emitters.

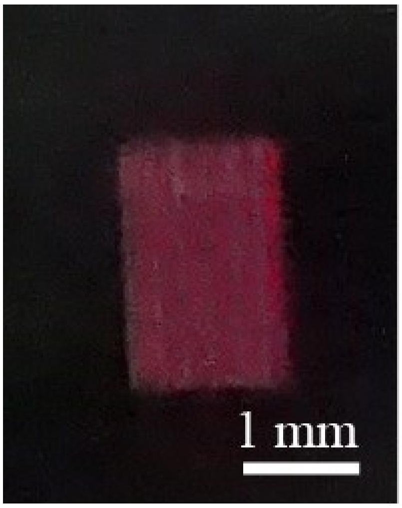

Figure S2 Purple EL emission from the fabricated microfluidic OLED device with integrated PLQ and 0.4wt% DBP-doped PLQ patterns under an applied voltage of 70V.

Reference

[S1] Kasahara, T. et al. Multi-color microfluidic organic light-emitting diodes based on on-demand emitting layers of pyrene-based liquid organic semiconductors with fluorescent guest dopants. *Sens. Actuators. B. Chem.* **207**, 481-489 (2015).