Supporting information

Multi-state Memristive Behavior in the Light-Emitting Electrochemical Cell

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Figure S1. Current–voltage characteristics of the memory devices fabricated with (a) (MEH-PPV)$_{20}$(MHPI)$_{4}$-3 and (b) (MEH-PPV)$_{20}$(MHPI)$_{6}$-5 as the memory layer.
Figure S2. (a) Current–voltage characteristics of the memory device fabricated with a MH7-b-PI_{3.8k} thin layer. (b) space-charge-limited current (SCLC) model fitting for the device.

Figure S3. Impedance measurement for (a) (MEH-PPV)$_{20}$(MHPI)$_{6}$-1, (b) (MEH-PPV)$_{20}$(P4VP)$_{6}$-1, and (c) (MEH-PPV)$_{20}$(PEO)$_{6}$-1 in the frequency range of 20 Hz to 1 MHz, respectively. In Randles equivalent circuit, $R_Ω$ represents the solution resistance, $C_{DL}$ is the capacitance for the double layer charging process, $R_{ct}$ is the contact resistance contributing to the charge transfer resistance through the electrode-polymer interfaces, and $Z_w$ is the Warburg impedance arising from the mass transfer process.
Figure S4. (a) Current−voltage characteristics of the memory devices fabricated with (MEH-PPV)$_{20}$(PEO)$_{6}$-1, and (MEH-PPV)$_{20}$(P4VP)$_{6}$-1 as the memory layer.

Figure S5. Optoelectronic properties for (ITO/memory layer /Al). The memory layer is a composite consisting of (a) (MEH-PPV)$_{20}$(PEO)$_{6}$-1 (b) (MEH-PPV)$_{20}$(P4VP)$_{6}$-1
**Figure S6.** AFM image of the memory layer (MEH-PPV)$_{20}$(MHPI)$_{6}$-1 stored in the ambient condition after three months.

**Figure S7.** Cyclic voltammetry traces of MH7-b-PI$_{3.8k}$ P4VP and PEO.
Figure S8. Current–voltage characteristics of a memory device fabricated with (MEH-PPV)$_{20}$(MHPI)$_6$-0 as the memory layer.

Figure S9. Impedance measurement for (a) (MEH-PPV)$_{20}$(MHPI)$_6$-1, (b) (MEH-PPV)$_{20}$(P4VP)$_6$-1, and (c) (MEH-PPV)$_{20}$(PEO)$_6$-1 after writing (5V charging, 3s), in the frequency range of 20 Hz to 1 MHz, respectively.
Figure S10. The energy levels for MH7-b-PI_{3.8k} and light-emitters used in this study.