Supporting Information for

Dynamic Photonic Perovskite Light Emitting Diode with Post Treatment Enhanced Crystallization as Writable and Wipeable Inscriber

Sheng Bi,[1] Wei Zhao,[1] Yeqing Sun,[1] Chengming Jiang,[1,*] Yun Liu,[2] Zhengran He,[3] Qikun Li,[1] Jinhui Song,[1,*]

1 Key Laboratory for Precision and Non-traditional Machining Technology of the Ministry of education, School of Mechanical Engineering, Dalian University of Technology, Dalian 116024, China

2 Department of Mechanical Engineering, University of Maryland, College Park, MA, 20742, USA

3 Center for Materials for Information Technology, The University of Alabama, Tuscaloosa, AL, 35487, USA

Corresponding Authors

*E-mail: jiangcm@dlut.edu.cn.

*E-mail: jhsong@dlut.edu.cn.

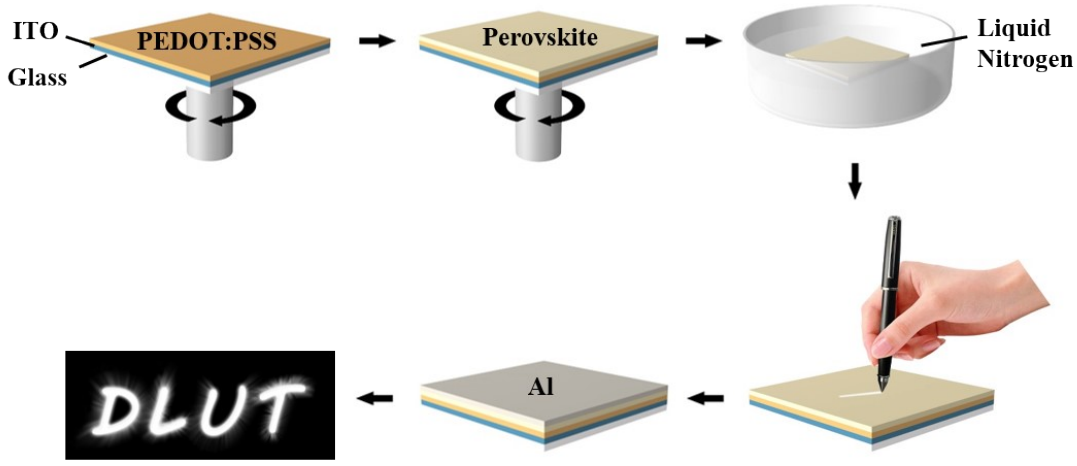

Figure S1. Schematic of the fabrication procedure of writable and wipeable PeLED.

Indium tin oxide (ITO) glass was cleaned in detergent, de-ionized water, acetone and isopropyl alcohol in sequence, and treated with oxygen plasma at 30W for 5min to increase the surface energy on ITO glass. Poly(3,4-ethylenedioxythiophene) polystyrene sulfonate (PEDOT:PSS) was spun-coat at 5000 rpm for 45 s onto the pre-cleaned ITO glass as hole transport layer. $PbBr_2$ was spun-coat at 2000 rpm followed by post anneal at 70 ℃ for 60 minutes and 90 ℃ for 15 minutes, respectively. CsBr solvent were spun-coat at 2000rpm three times in sequence with isopropyl alcohol (IPA) as anti-solvent. A heating pen was used afterwards to write letters on the film. LiF/Al was thermally evaporated onto the sample as the cathode of the device. It is the same procedure to fabricate flexible WWPeLED on poly(ethylene terephthalate) (PET) substrate. ITO was sputtered onto the pre-cleaned PET substrate followed by spin-coating PEDOT:PSS and perovskite films. A heating pen was applied to record handwriting after the sample being refrigerating treatment. After finishing fabricating the sample, anode and cathode were connected to the positive and negative pole of the power supply, and a proper value of bias was applied to the device. The letters we wrote on perovskite film were lit up while the

surrounding films still kept dark. It is also feasible to print various kinds of patterns from molds instead of handwriting onto the films so as to show-up patterns. When the voltage applied to the sample is high enough, the dark area will be lit up and the patterns will be totally wiped-out, and the device will act as a regular PeLED.

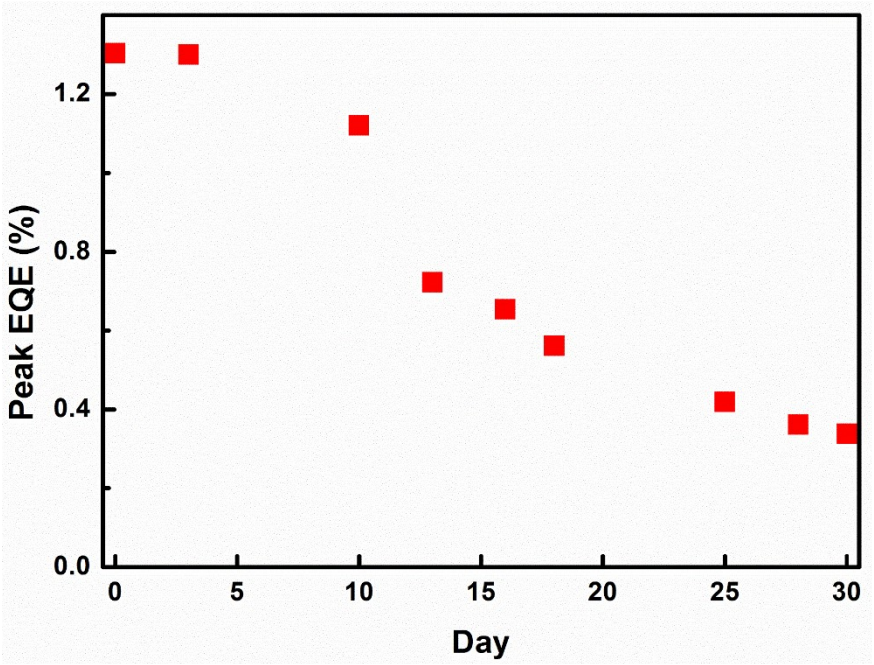

Figure S3. Lifetime of the $CsPbX_3$ PeLED after wiping lasting for 30 days.

The lifetime of the wiped PeLED was carried out in atmosphere without encapsulation for 30 days. The lifetime of the devices keeps almost the same EQE in the first 5 days and starts to decay after 10 days. The EQE reaches less than 0.4% after 30 days.

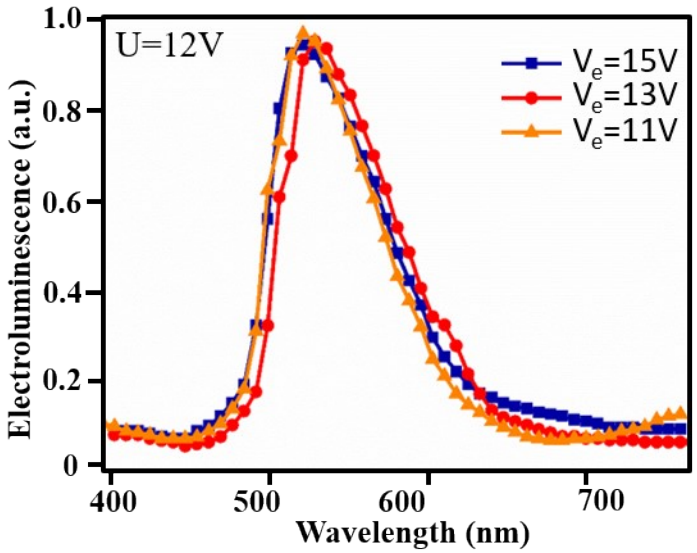

Figure S3. Normalized electroluminescence spectra of the wiped $CsPbX_3$ PeLED under the erasing voltage of 11 V, 13 V and 15 V.

Electroluminescence spectra of the performance of the pattern-wiped $CsPbX_3$ PeLED is shown in Figure S3. The pattern on the devices are wiped out under the bias of 11V, 13V and 15V before providing a constant voltage of 12 V. It is clearly seen that the position of the peak from the device wiped by 15V is in the middle while higher or lower wipe voltages lead to blue or red shift, respectively.

Reference

1) J.S. Kim, R.H. Friend, I. Grizzi and J.H. Burroughes, Applied Physics Letters 2005, 87, 2.

2) T.Q. Nguyen, I.B. Martini, J. Liu and B.J. Schwartz, Journal of Physical Chemistry B 2000, 104, 2, 237.

3) C.L. Donley, J. Zaumseil, J.W. Andreasen, M.M. Nielsen, H. Sirringhaus, R.H. Friend and J.S. Kim, Journal of the American Chemical Society 2005, 127, 37, 12890.