Supplementary Information

Water-borne Photo-Sensitive Polyimide Precursor for Eco-friendly Process of Organic Thin Film Transistor

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Keywords: Polyimide, Photo-sensitive poly(amic acid) salt, Water-borne polymer, Polyimide dielectric, Green process.

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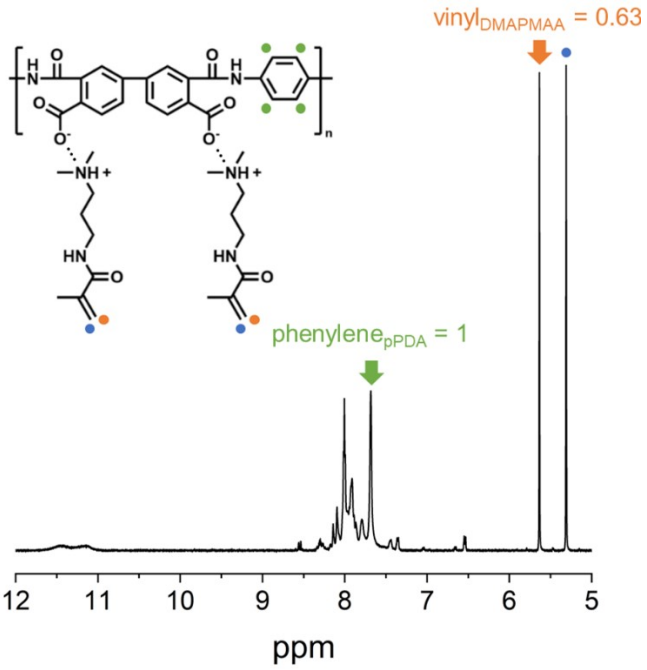


Figure S1. Relative integration value of phenylene in the polymer backbone and vinyl protons in the organic base of PAAS-DMAPMAA. The resulting ratio was [vinyl$_{DMAPMAA}$] : [phenylene$_{pPDA}$] = 0.63 : 1, which is similar to the feed molar ratio in reaction mixture [DMAPMAA]:[pPDA] 2 : 1.

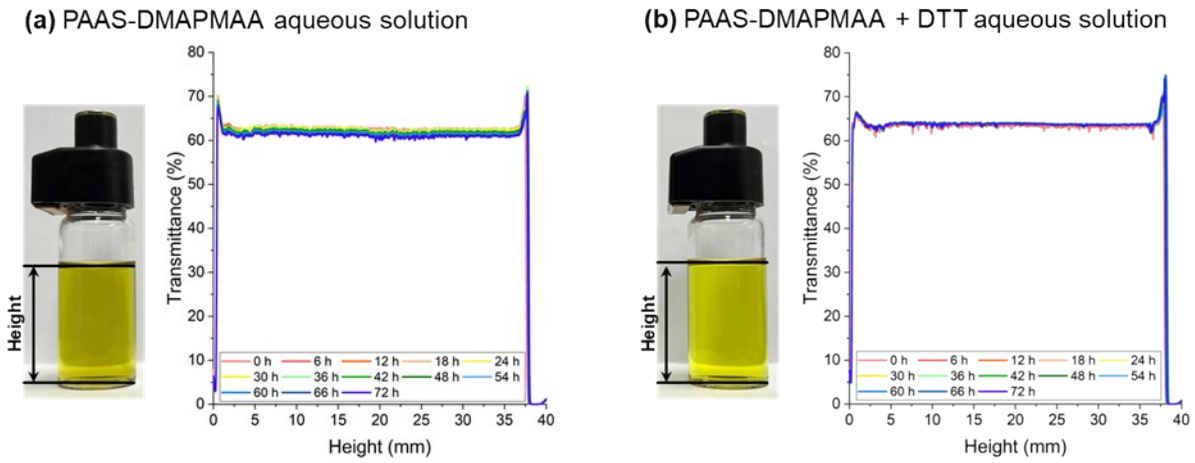


Figure S2. Transmittance measurement for the aqueous solution containing (a) 3 wt% of PAAS-DMAPMAA and (b) (2.98 wt% of PAAS-DMAPMAA + 0.62 wt% of DTT). The compositions are identical to the formulation solution in the photo-patterning process.

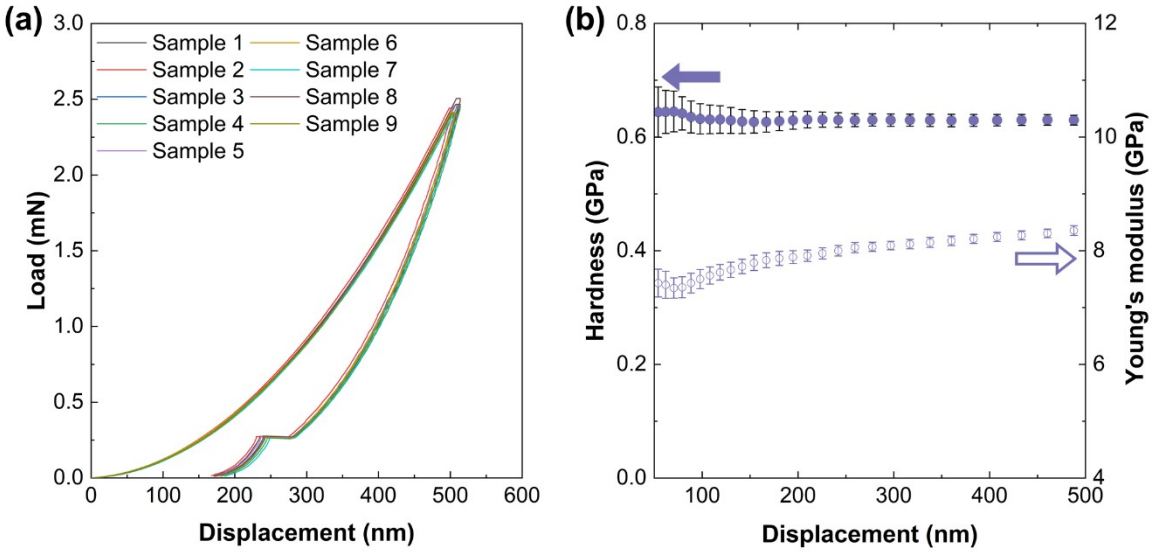


Figure S3. (a) Load-displacement response of BPDA-pPDA thin films obtained by nano-indentation test. The sample 8 result is identical to Figure 3(c). (b) The hardness and Young's modulus versus displacement of BPDA-pPDA thin films were calculated from Figure S1(a).

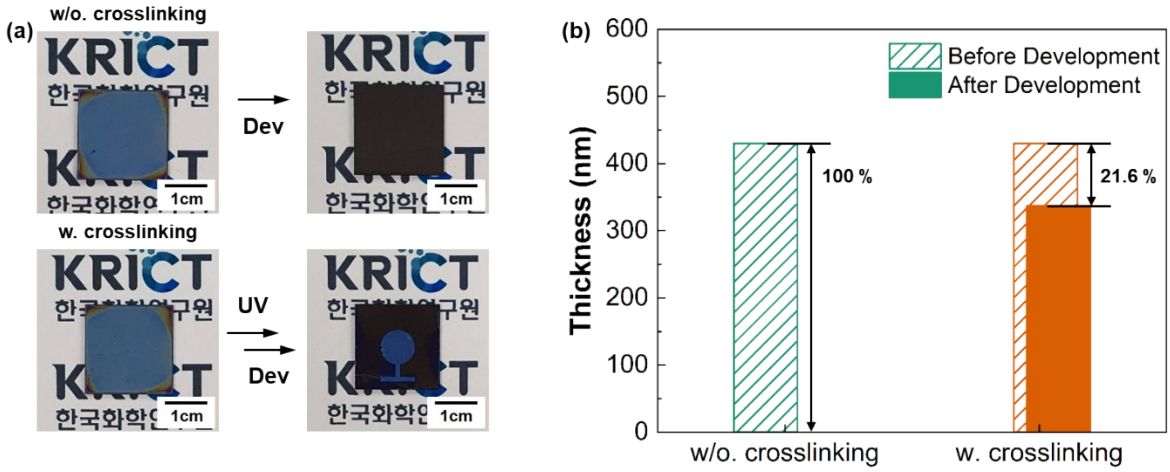


Figure S4. (A) Elimination of PAAS-DMAPMAA before and after the photocrosslinking process. (B) The change in thickness was determined by alpha-step measurement.

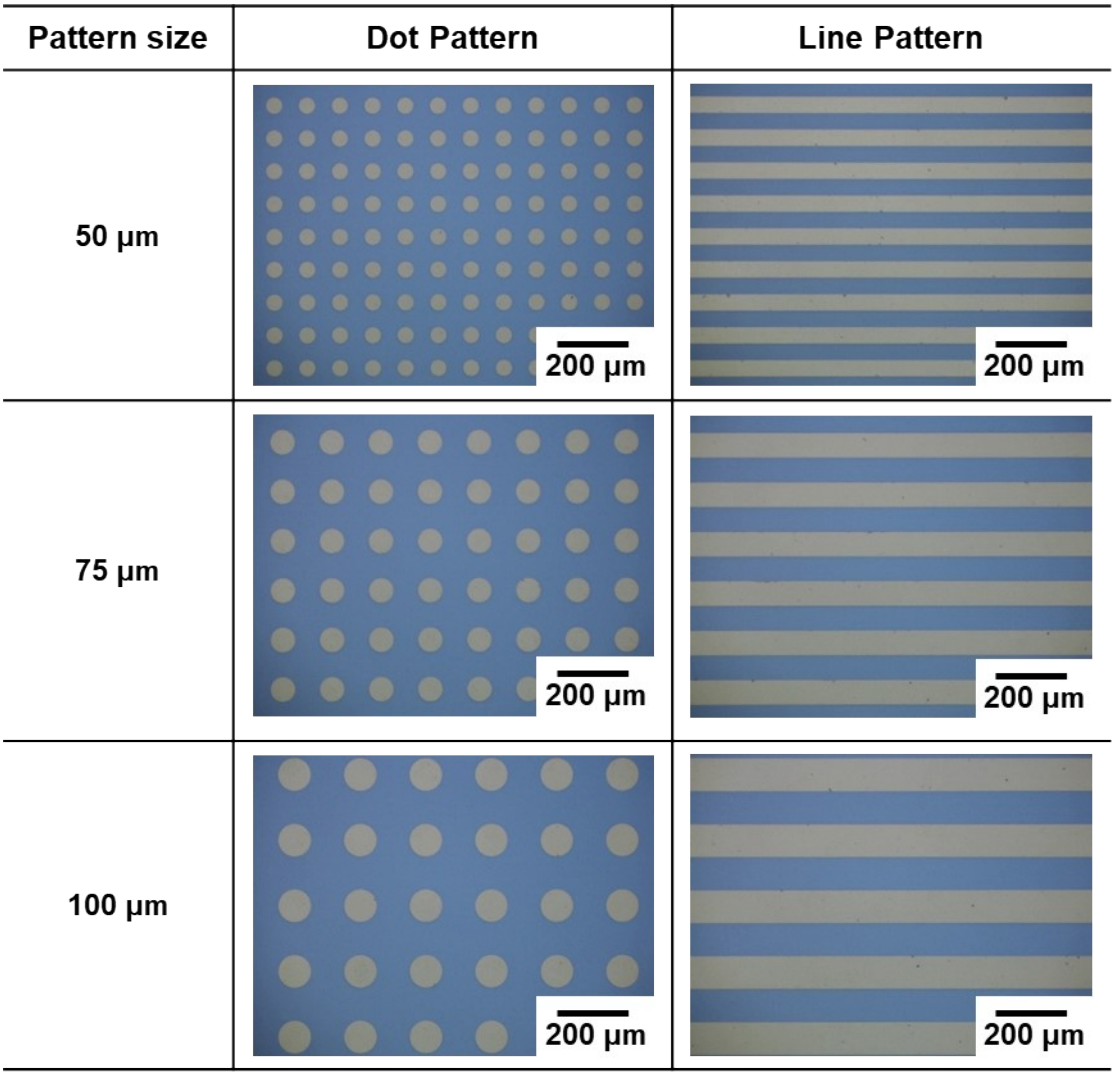


Figure S5. OM images of the dot- and line-patterned photo mask with different pattern sizes.

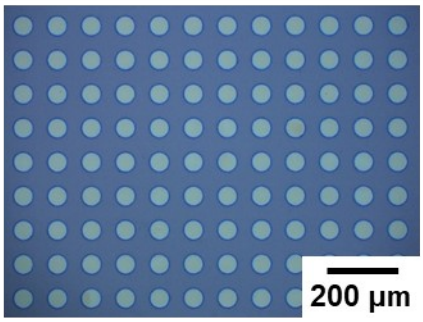
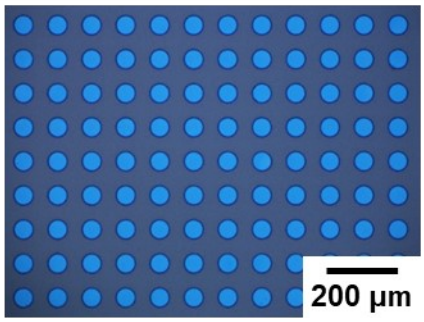
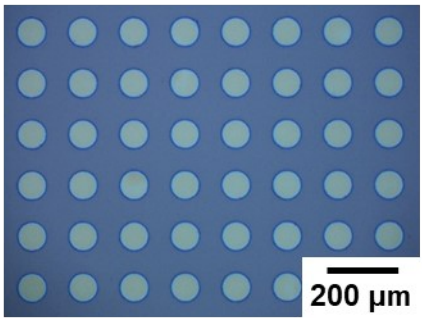
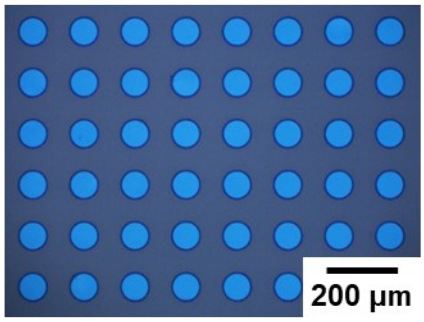
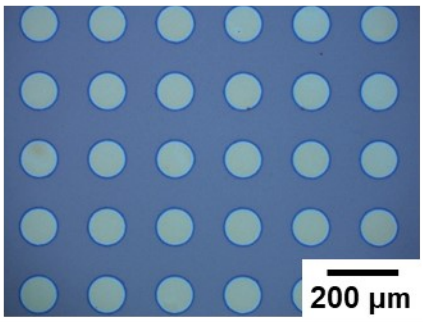
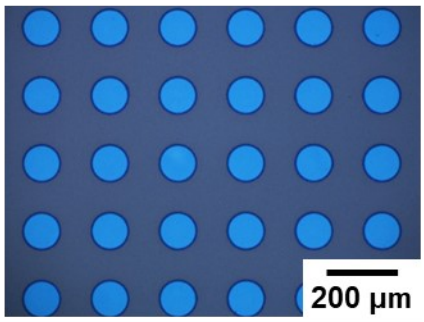
Pattern size	Patterned PAAS-X-linked	Patterned PI
50 μm		
	Average size = 55.3 (± 1.0) μm	Average size = 54.9 (± 0.3) μm
75 μm		
	Average size = 83.5 (± 0.5) μm	Average size = 82.5 (± 1.4) μm
100 μm		
	Average size = 109.8 (± 0.6) μm	Average size = 108.4 (± 0.9) μm

Figure S6. OM images of dot-patterned polymer films with different mask pattern sizes.

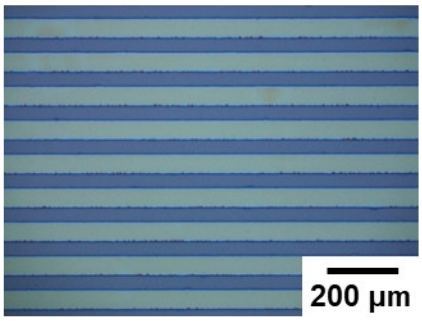
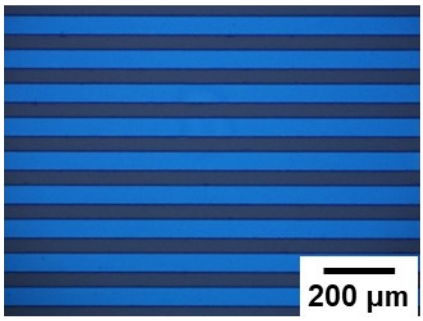
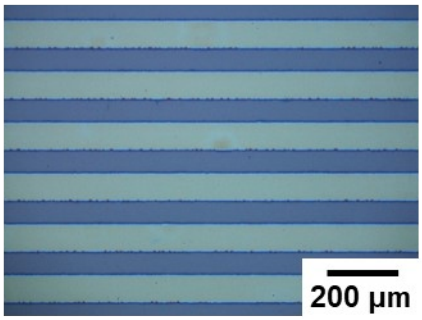
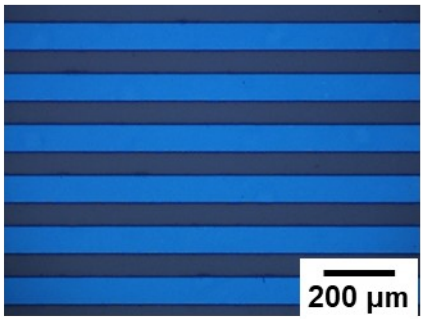
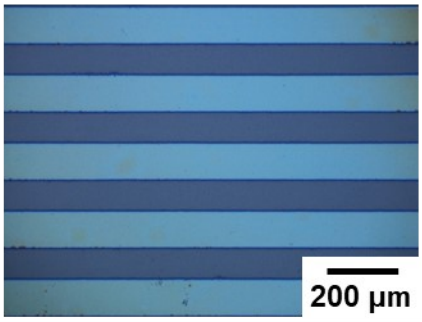
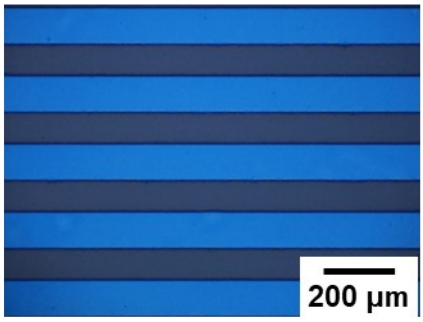
Pattern size	Patterned PAAS-X-linked	Patterned PI
50 μm		
	Average size = 54.7 (± 0.3) μm	Average size = 52.9 (± 0.3)
75 μm		
	Average size = 80.3 (± 0.1)	Average size = 77.2 (± 0.7)
100 μm		
	Average size = 104.5 (± 0.5)	Average size = 102.8 (± 1.6)

Figure S7. OM images of line-patterned polymer films with different mask pattern sizes.

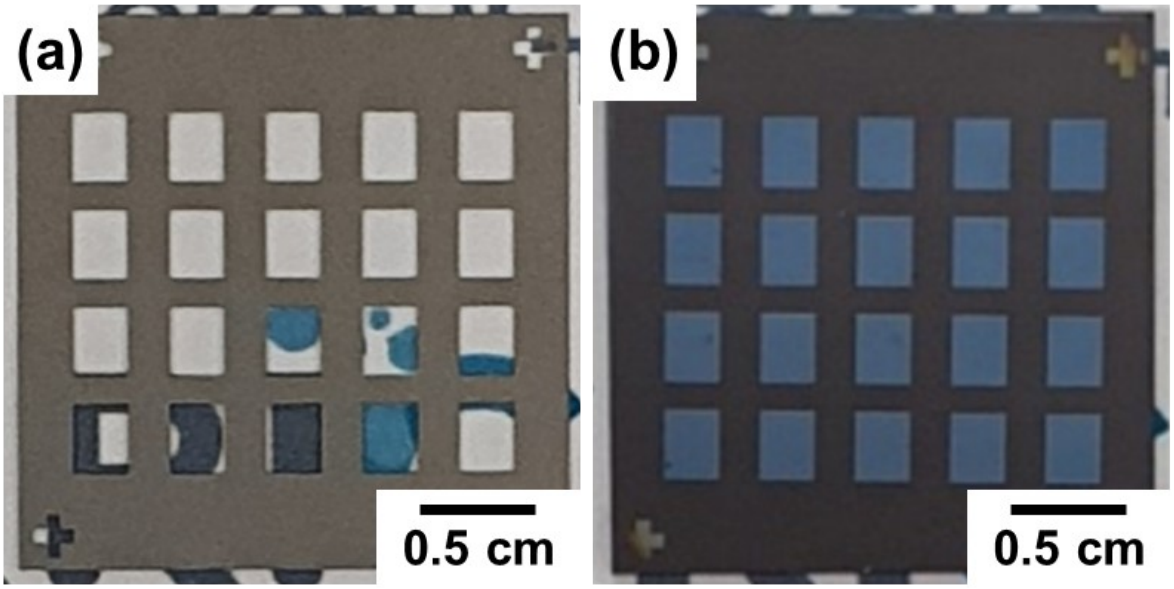


Figure S8. (a) Visual images of photo-mask for micropatterned TFT device fabrication. (b) The micropatterned PI was fabricated via the photo-lithography and thermal imidization processes by using the mask depicted in (a).