

1 **Supplementary Information**

2 **Crystalline organic thin films for crystalline OLEDs (II): weak epitaxy growth of** 3 **phenanthroimidazole derivatives**

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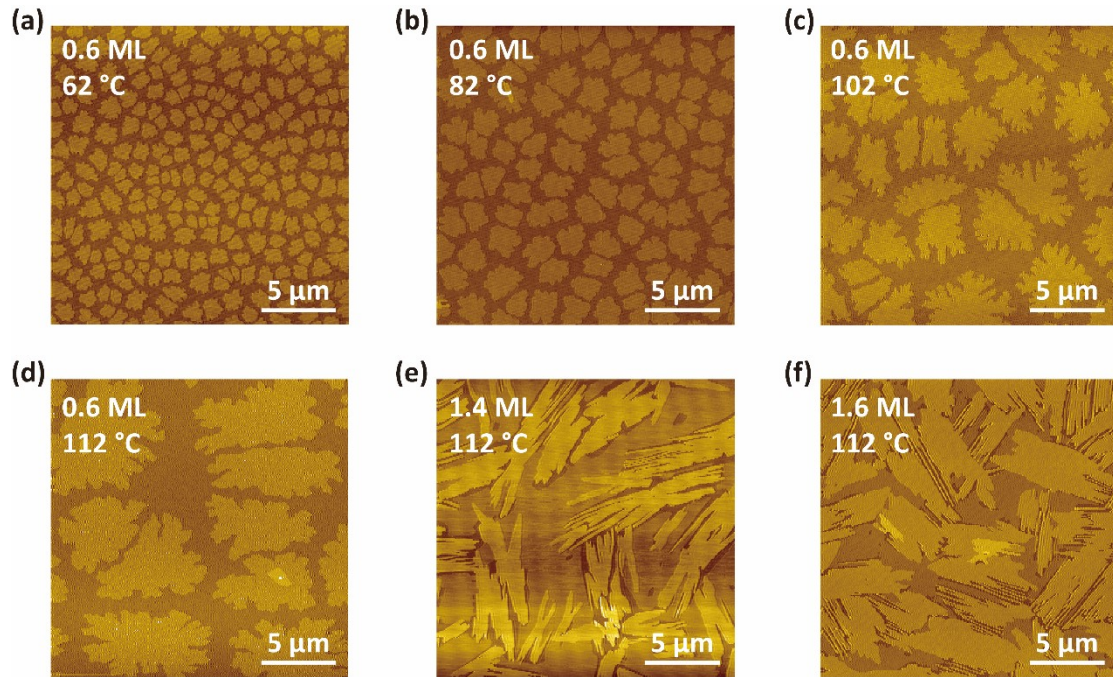
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21 **1. Morphologies of BP1T films grown at different substrate temperatures**

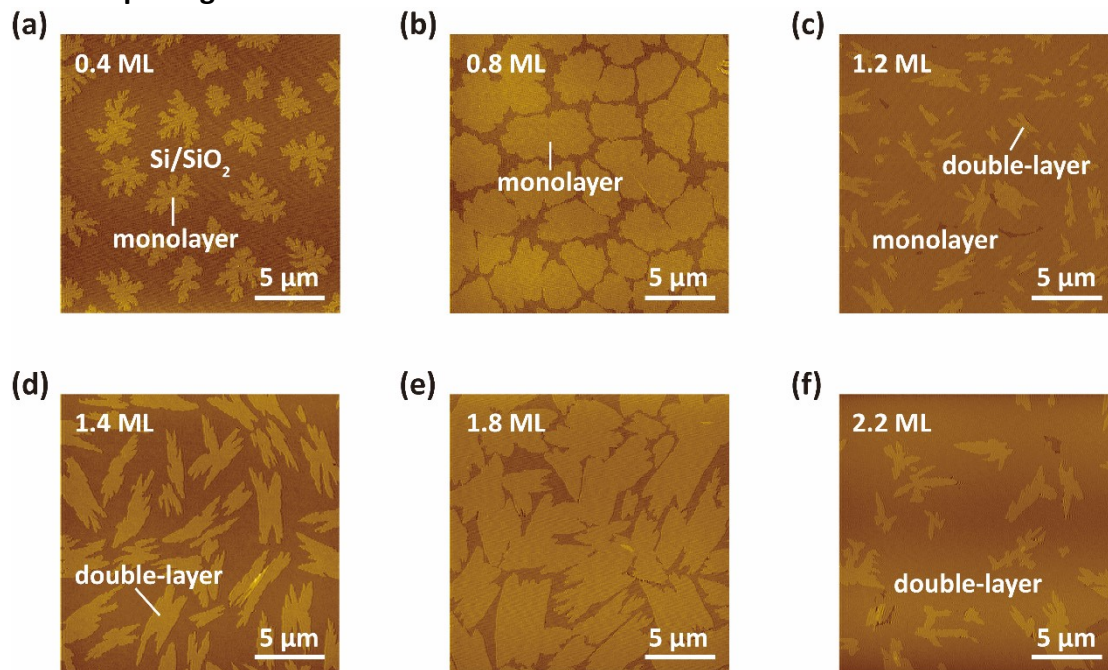


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23 **Fig. S1** AFM images of BP1T films grown at different substrate temperatures. (a-d) 0.6
24 ML BP1T grown at 62 °C (a), 82 °C (b), 102 °C (c), and 112 °C (d). (e-f) 1.4 ML (e) and
25 1.6 ML (f) BP1T grown at 112 °C.

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27 **2. Morphologies of different thicknesses BP1T**



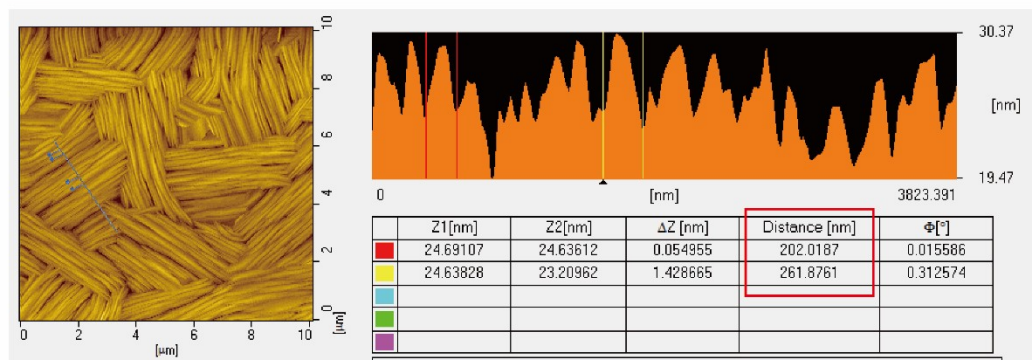
28

29 **Fig. S2** AFM images of 0.4 (a), 0.8 (b), 1.2 (c), 1.4 (d), 1.8 (e), and 2.2 (f) monolayer
30 BP1T films at the substrate temperature of 102 °C.

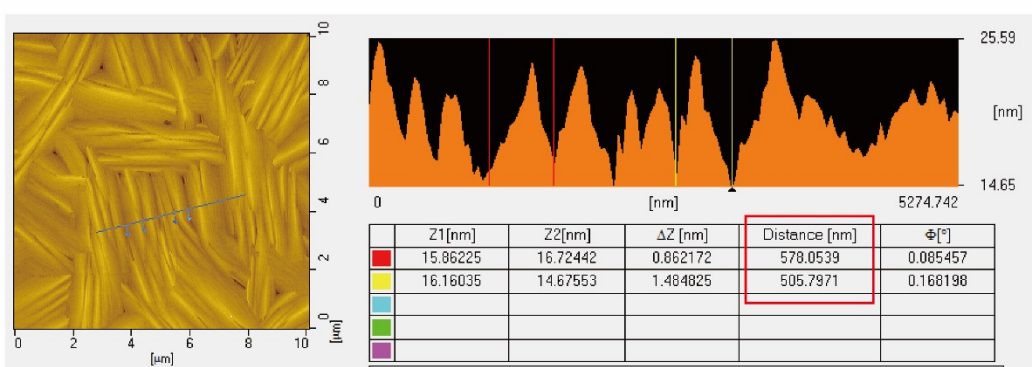
31

32 **3. Width of 2FPPIcz strip-like crystal on BP1T**

(a) **1.2 ML BP1T / 20 nm 2FPPIcz**



(b) **2.2 ML BP1T / 20 nm 2FPPIcz**



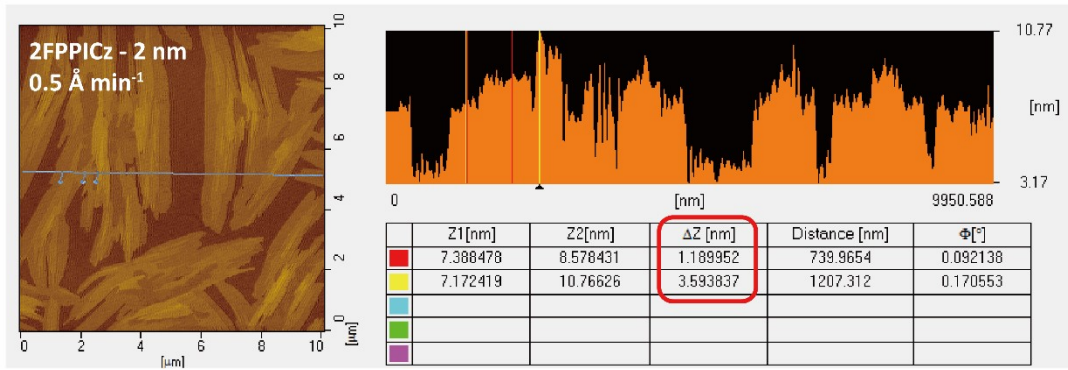
33

34 **Fig. S3** (a-b) Width of 2FPPIcz strip-like crystals grown on 1.2 (a) and 2.2 (b) monolayer
 35 BP1T.

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37 **4. Height of 2FPICz crystals on double-layer BP1T**

(a)

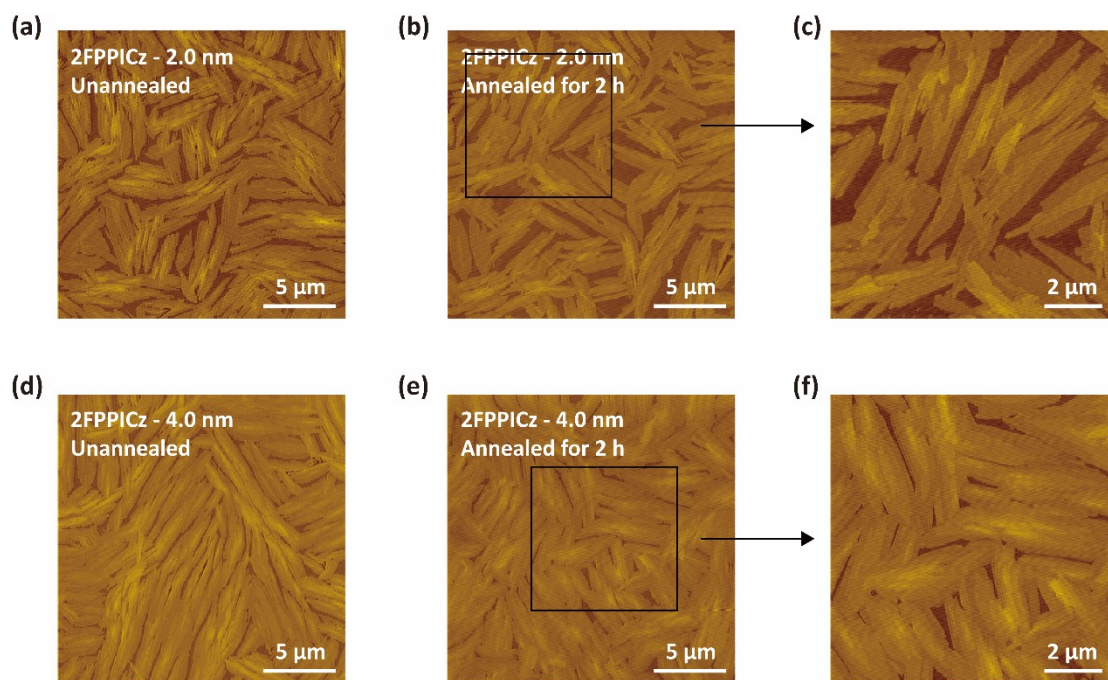


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39 **Fig. S4** Height map of 2-nm thick 2FPICz thin film deposited on 2.2-monolayer BP1T.

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41 **5. Morphologies of different thicknesses 2FPPIcZ before and after annealing**



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43 **Fig. S5** (a and b) AFM images of unannealing (a) and annealing for 2 hours (b) 2.0-nm
44 thick 2FPPIcZ thin film. (d and e) AFM images of unannealing (d) and annealing for 2
45 hours (e) 4.0-nm thick 2FPPIcZ thin film. (c and f) The corresponding zoom images of
46 (b) and (e).

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48 **6. Morphologies of different thicknesses 2FPPIcZ on BP1T**

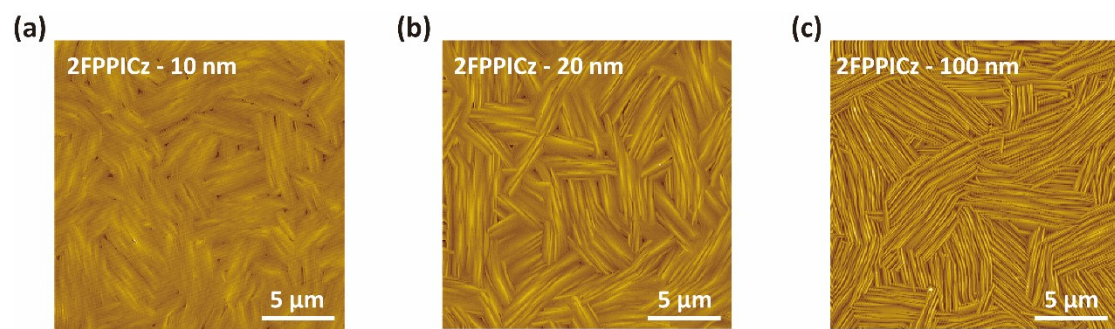
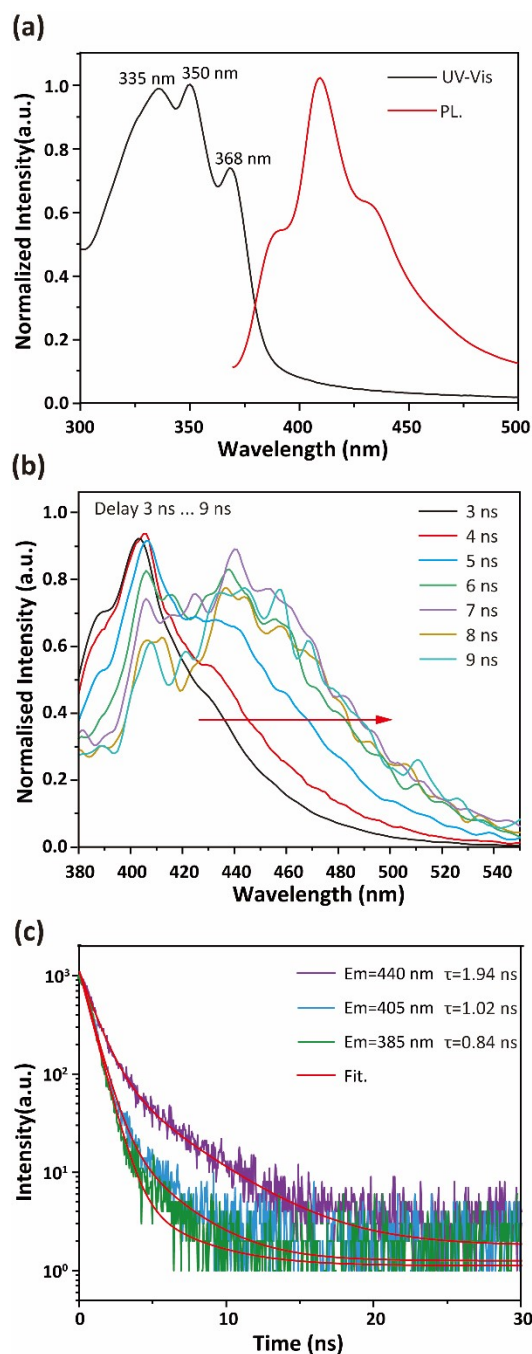


Fig. S6 Morphologies of 2FPPIcZ with different thicknesses on BP1T. The AFM images of different thicknesses of 10 nm (a), 20 nm (b), and 30 nm (c).

53 **7. Optical properties of 2FPPIcZ crystalline film**



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55 **Fig. S7** Optical properties of 2FPPIcZ crystalline film. (a) Normalized ultraviolet-visible
 56 (UV-vis) absorption and photoluminescence (PL) spectrum of 2FPPIcZ crystalline thin
 57 film from [J. Mater. Chem. C, 2021, 9, 2236-2242]. (b) Time-resolved
 58 photoluminescence spectra of 40 nm-thick 2FPPIcZ crystalline thin film. (c) Transient
 59 decay curves of 40 nm-thick 2FPPIcZ crystalline thin film.

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61 **Table S1** Fluorescence lifetimes (τ) of 2FPPI Cz crystalline film depend on wavelength.

Em (nm)	A ₁	τ_1 (ns)	A ₂	τ_2 (ns)
385	1148.42	0.74	8.7	3.56
405	1032.68	0.75	36.49	2.98
440	1025.86	0.97	122.11	3.94

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