

Supporting Information

In situ growth of high quality crystals for organic electronics

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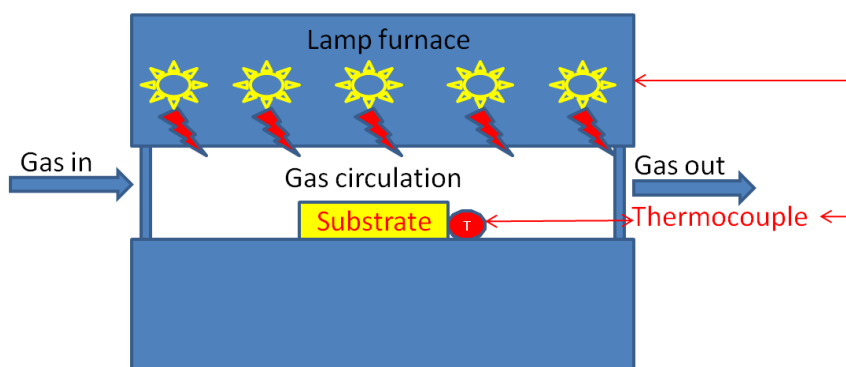
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Scheme S1. Illustration of RTP. The material on a substrate is heated with an array of lamps under thermal control. Regulated inert gas flow leads to efficient mass transfer.

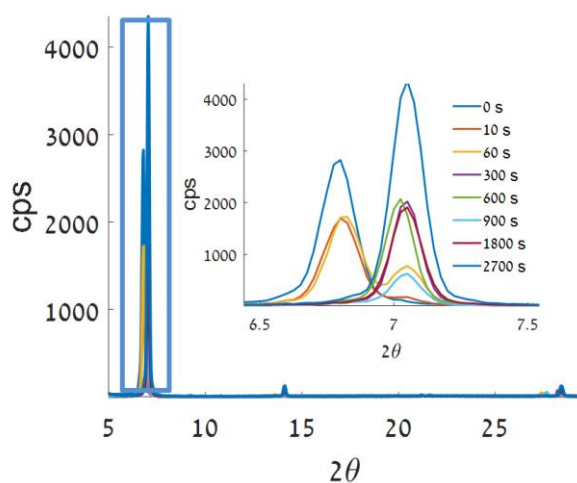


Figure S1. Powder X-ray diffractograms recorded from 70-nm CuPc nanocrystalline thin films PVD-deposited on a substrate at 110°C after RTP at 350 °C (CPS = counts per second) for 0, 10, 60, 300, 600, 900, 1800 and 2700 s. Inset shows magnified view of the outlined area. Different intensities were obtained because measurements were made for different thin films.

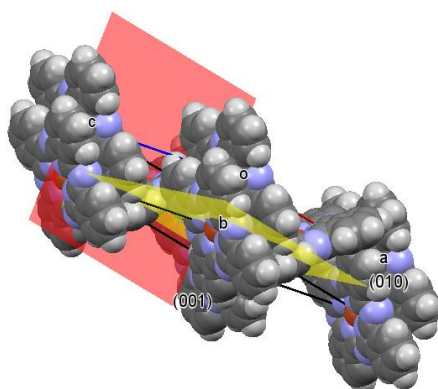


Figure S2. Crystal structure of the β -form CuPc. Yellow and red indicate (010) and (001) planes respectively.

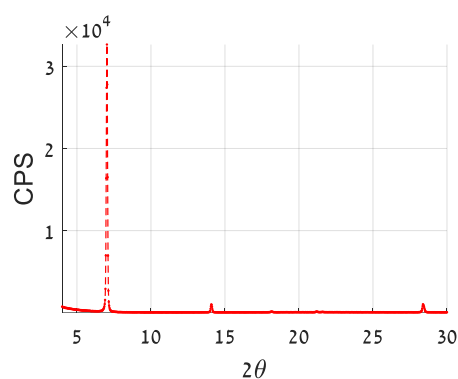


Figure S3. XRD showing preferred orientation of β form CuPc crystals obtained by RTP of 70-nm film deposited by PVD on a substrate heated at 110 °C (bottom-gate/top-contact device).

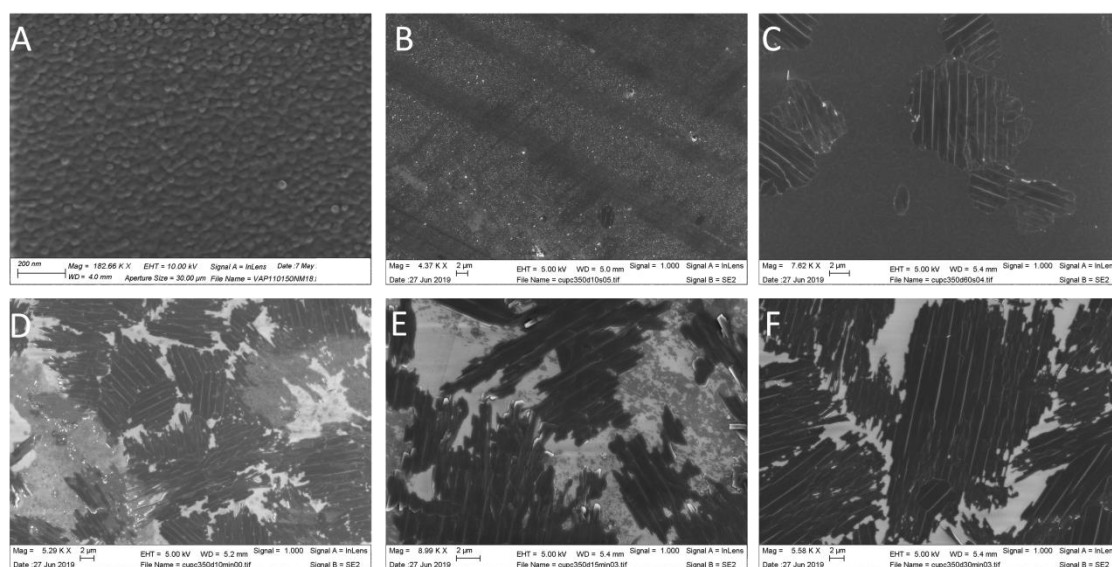


Figure S4. SEM images of 150-nm CuPc thin films deposited by PVD on the substrate heated at 110°C after RTP in argon flow (1000 sccm) at 350 °C: (A) 0 s, (B) 10 s, (C) 60 s, (D) 600 s, (E) 900 s, and (F) 1800 s.

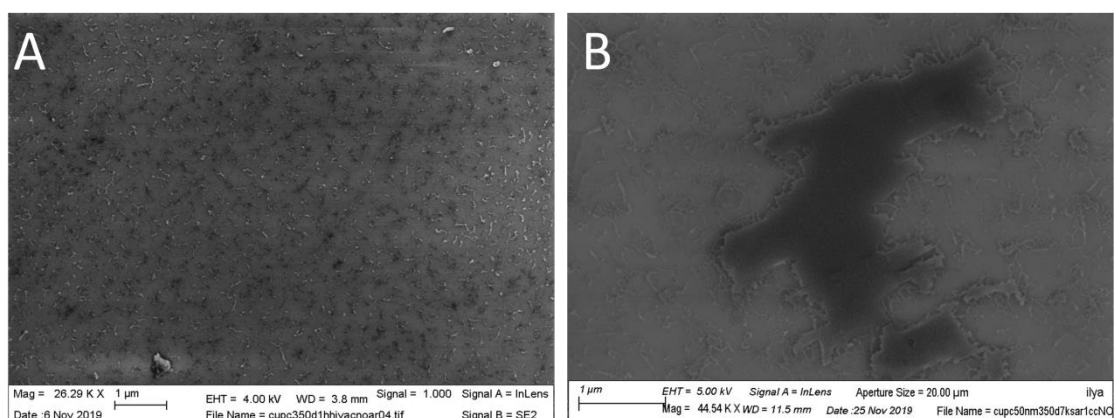


Figure S5. CuPc after RTP (2 h at 350 °C) of a 70-nm thick film deposited by PVD on a substrate heated to 110 °C: (A) without Ar flow, (B) under low argon flow (1 sccm).

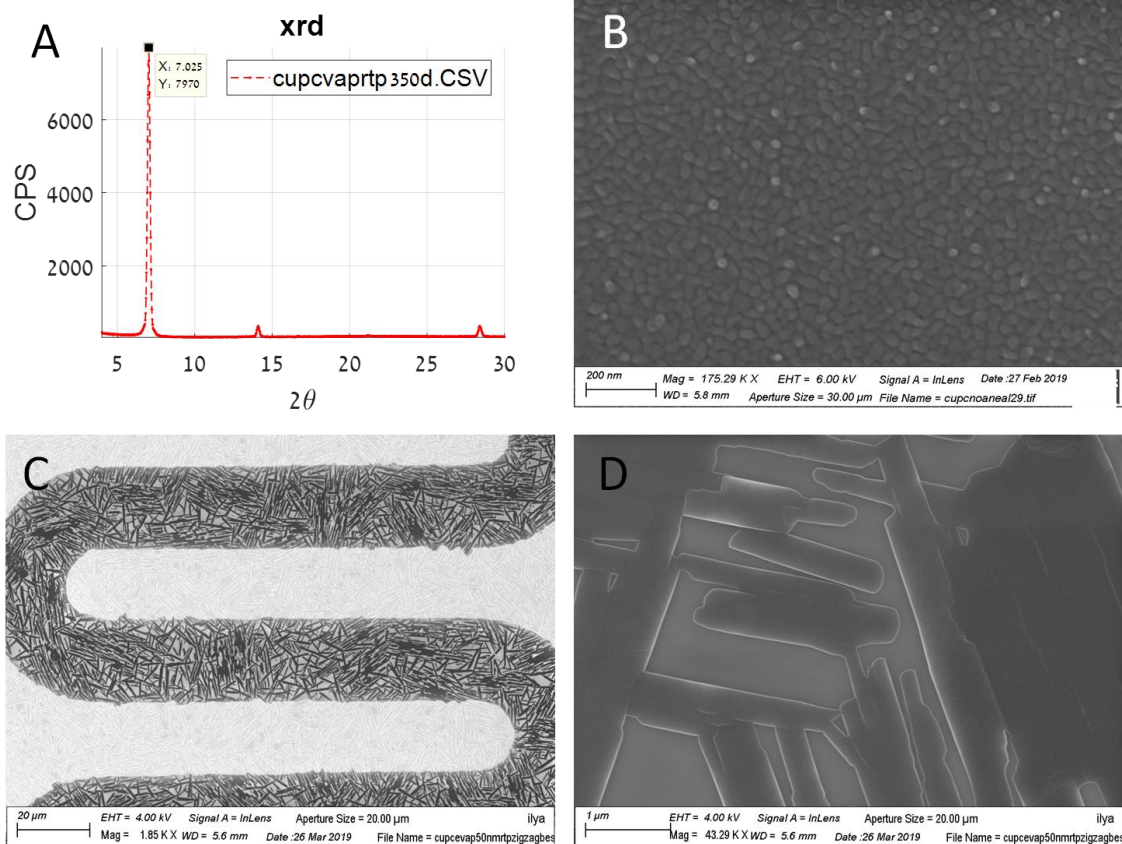


Figure S6. β form CuPc crystals obtained after RTP of 70-nm thick film deposited by PVD on a silicon substrate at 25 °C. (A) XRD of β form CuPc crystals obtained after RTP; (B) SEM images of 70-nm CuPc thin films deposited by PVD on a silicon substrate at 25 °C, before RTP; (C) crystals on silicon substrate after RTP treatment, covered with mask-made Au contacts; (D) crystals on silicon substrate, zoom in. A network of long and thin crystals was obtained.

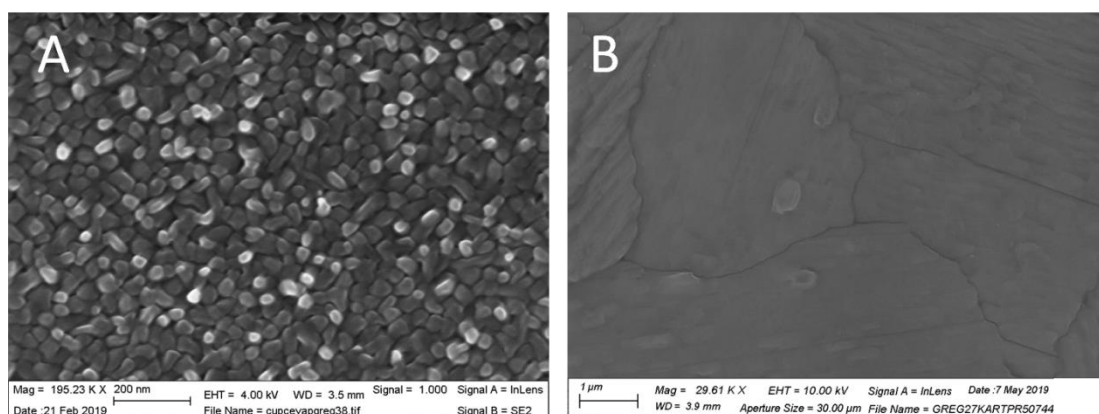


Figure S7. SEM images of 400-nm thick CuPc film deposited by PVD on a silicon substrate at 110 °C: (A) before and (B) after RTP (3 h, at 350 °C under Ar flow of 1000 sccm).

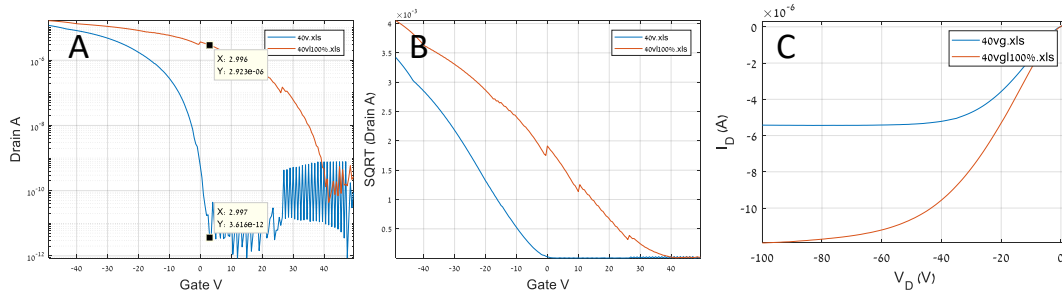


Figure S8. (A,B) transfer and (C) output characteristics of the of β form CuPc crystals obtained by RTP of 70-nm thick film deposited by PVD on a silicon substrate at 25 °C under white light illumination of 24 mW/cm² (red line) and in dark (blue line). Currents are presented at absolute value.

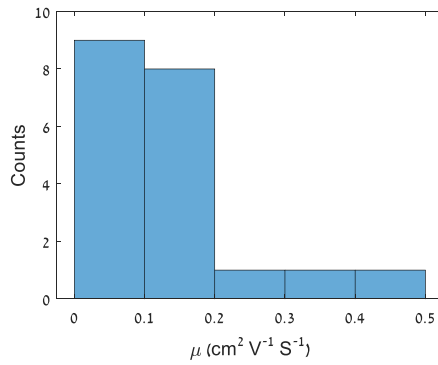


Figure S9. Histogram of the mobilities for β form CuPc crystals obtained by RTP of 70-nm thick film deposited by PVD on a silicon substrate at 110 °C.

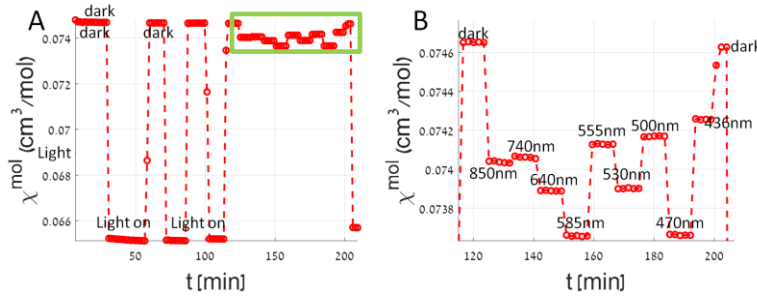
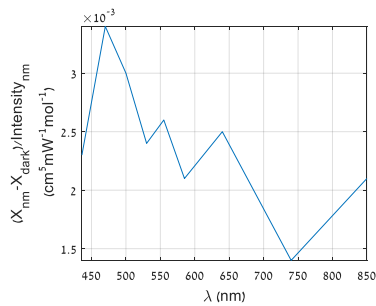


Figure S10. (A) Changes of magnetic susceptibility of β -form CuPc powder obtained RTP treatment under white light illumination of $\approx 30 \text{ mW/cm}^2$ and with color filters of 850-436 nm at 5K under magnetic field $H=1 \text{ kOe}$. The light and wave length were switched manually during the measurement; (B) Magnified view of the marked area in (A).



$\lambda(\text{nm})$	$X(\text{cm}^3/\text{mol})$	Light intensity (mW/cm ²)
dark	0.0747	NA
850	0.0740	0.2895
740	0.0741	0.4317
640	0.0739	0.3047
585	0.0737	0.4825
555	0.0741	0.2031
530	0.0739	0.3149
500	0.0742	0.1625
470	0.0737	0.2946
436	0.0743	0.1727

Figure S11. Changes in normalized magnetic susceptibility of β -form CuPc powder obtained after RTP treatment, under white light illumination with color filters of 436-850 nm at 5K under magnetic field $H=1$ kOe. The light intensity was measured for each color filter.

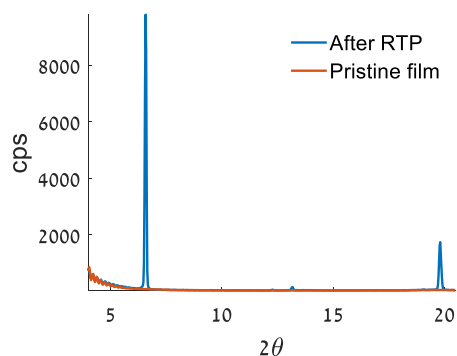


Figure S12. Powder X-ray diffractograms recorded from rubrene films deposited at 25 °C before and after RTP at 270 °C under Ar flow (1000 sccm). CPS = counts per second.

Film thickness(nm)	PVD deposition temperatures (°C)	Ar flow (sccm) at 350 °C for 3 h	Morphology
70	110	1000	Well-separated bundles of oriented ribbon-like microcrystal's
70	25	1000	Interconnected network of micro ribbon crystals 100-500 nm in width
70	110	<1	Crystalline structures unsuitable for device fabrication
100-200	110	1000	Isolated flat domains of interacting ribbons
400	110	1000	Continuous crystalline domains

Table S1. Effect of PVD and RTP parameters on the CuPc morphology.