Supporting Information

Directional solvent vapor annealing for crystal alignment in solution processed organic semiconductors

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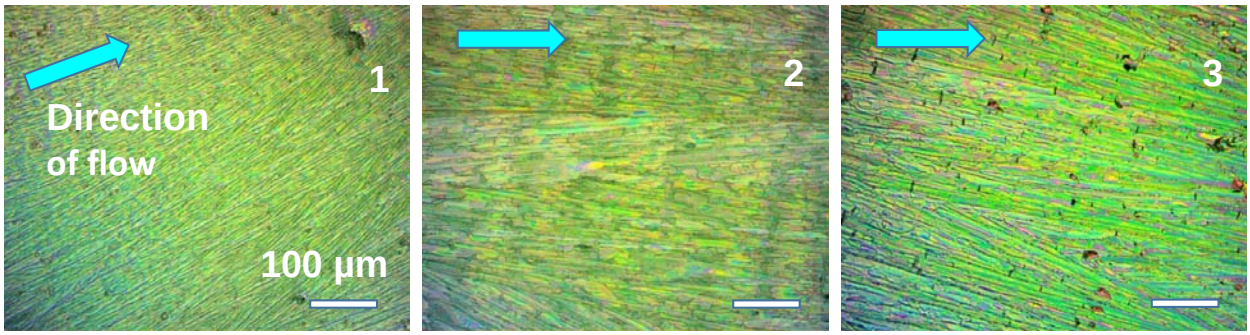

Figure S1. Morphology of TIPS-pentacene films at $d_{s,i}$ = 6.5", $h_{c,i}$ = 2 mm and $f_{t,i}$ = 5 L/min in three different batches.

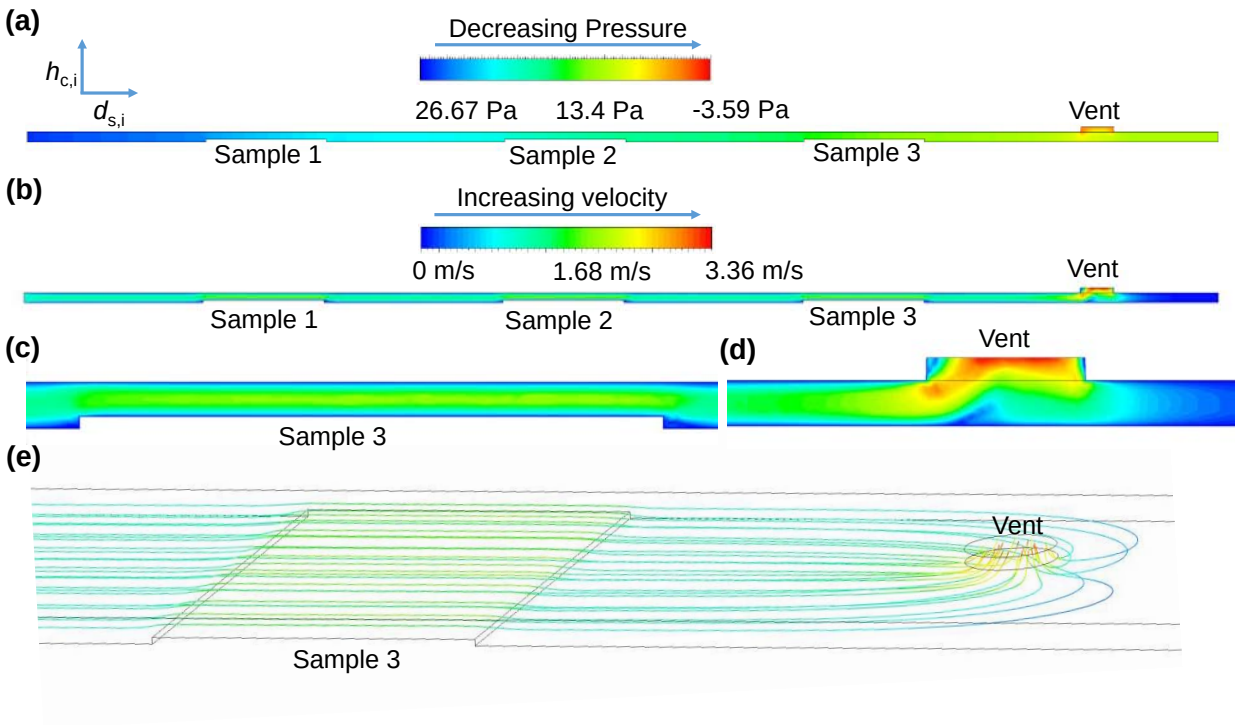

Figure S2. CFD simulation results showing pressure variation **(a),** and velocity variation **(b)** in the interaction tube for $h_{c,i}$ = 2 mm. A closer view of velocity profile over sample surface **(c)**, and near the vent opening **(d)**. **(e)** Velocity streamlines in the interaction tube.

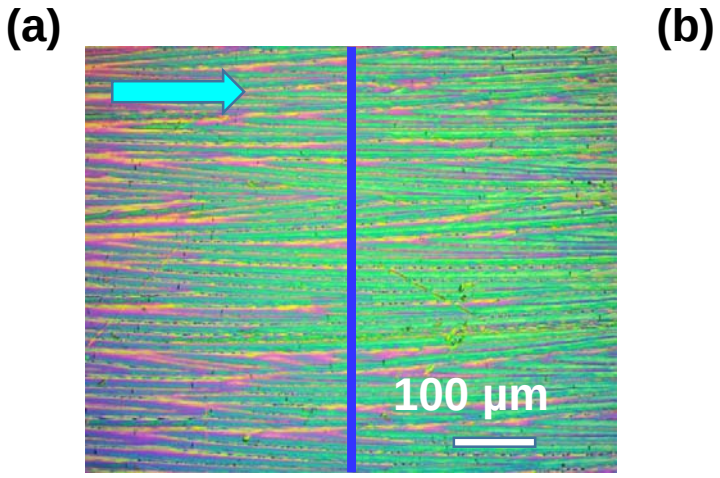

Figure S3. An optical micrograph of DSVA TIPS-pentacene crystals **(a)**, Line profile along the solid line in the micrograph **(b)**.

Supplementary Note 1: **Calculation of Reynolds number for gas-vapor mixture**

Reynolds number which is the ratio of inertial forces to the viscous forces of the fluid can be given as

$$Re = \rho \upsilon L/\eta \qquad (S1)$$

Where ρ is the density of the fluid in Kg/m^3, v is the velocity in m/s, L is the characteristic linear dimension in m, and η is the dynamic viscosity of the fluid in Pa.s.

To estimate the Reynolds number, the gas-vapor mixture has been assumed as an ideal binary mixture, i.e. excess volume of mixing is zero and component of mixture are non-reacting. In the this case of ideal binary mixture of nitrogen and toluene, dynamic viscosity of the mixture, η_m can be given from Arrhenius equation as following,

$$ln(\eta_m) = X_{N2} ln(\eta_{N2}) + X_{Tol} ln(\eta_{Tol}) \qquad (S2)$$

Similarly density of the mixture ρ_m can be given as,

$$\rho_m = X_{N2}\rho_{N2} + X_{Tol}\rho_{Tol} \qquad (S3)$$

Where X_{N2} and X_{Tol} are the mole fraction of the components, η_{N2} and η_{Tol} are the dynamic viscosities of pure components and ρ_{N2} and ρ_{Tol} are the densities of the pure components[1].

Values of dynamic viscosity of nitrogen and toluene are 1.81×10^{-5} Pa.s and 5.6×10^{-4} respectively. Values of density of nitrogen and toluene are 1.165 Kg/m^3 and 867 Kg/m^3 respectively.

Considering L as 3.175×10^{-2} m (width of interaction tube) and v as 1.68 m/s, in the absence of toluene vapors (X_{Tol}=0), substituting equation S2 and S3 in S1 yields a Reynolds number of 3433, which indicates a transitional flow in the interaction zone. Even a small quantity of solvent (X_{Tol}=0.05) results into a large value of Reynolds number of 110000, making the flow of this

gas-vapor mixture completely turbulent. With increasing toluene content in the mixture, turbulence of the mixture is set to increase.

Reference

1. Viswanath, D. S.; Ghosh, T. K.; Prasad, D. H. L.; Dutt, N. V. K.; Rani, K. Y. VISCOSITIES OF SOLUTIONS AND MIXTURES. In *Viscosity of Liquids: Theory, Estimation, Experiment, and Data*, Springer Netherlands: Dordrecht %@ 978-1-4020-5482-2, **2007**, pp 407-442.