Supplementary Information

Doping kinetics in organic mixed ionic-electronic conductors: Moving front experiments and the stress effect

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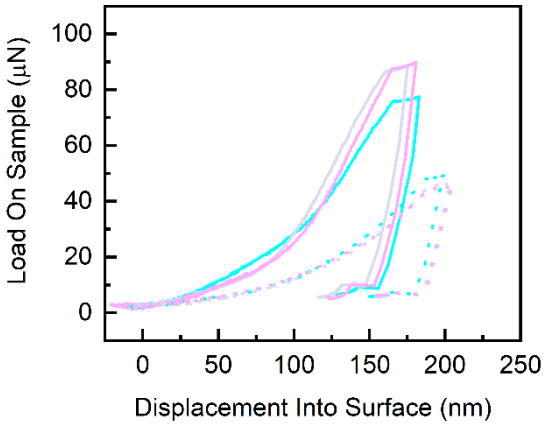


Figure S1. Representative load-displacement curves of PProDOT upon indentation on the pristine (solid) and doped (dotted) regions.

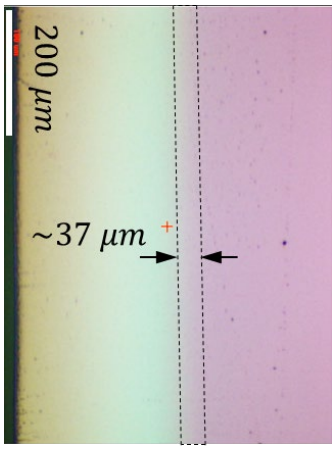


Figure S2. Moving front width of ~ 37 μm observed by optical microscopy at 2 h after the application of the voltage.

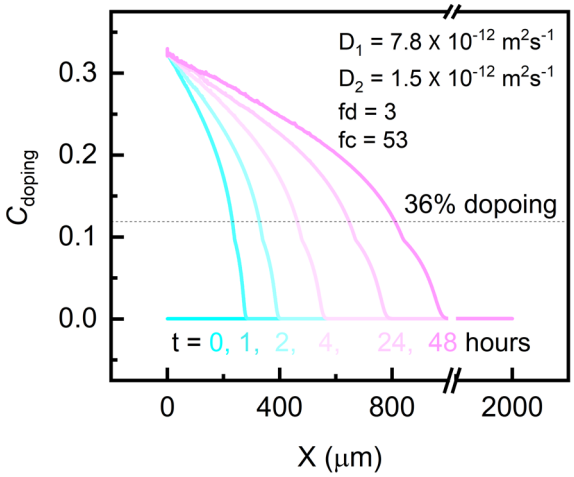
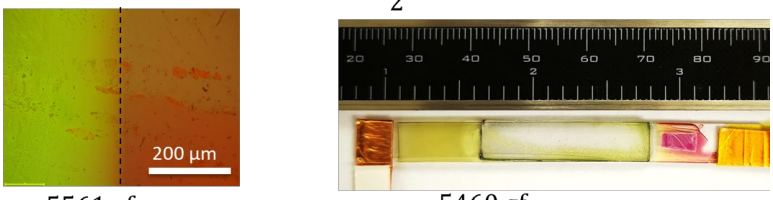


Figure S3. Moving front profile in the long-time propagation using apparent diffusivity D_1 and D_2.

$$\text{Pressure} = \frac{\text{Force}}{\text{Area}}$$

$$\frac{2326\ \text{gf}}{28 \times 50\ \text{mm}^2} = 1.63\ \text{MPa} \qquad \frac{5126\ \text{gf}}{\frac{(3.18 + 2.50)}{2} \times 6.33\ \text{mm}^2} = 2.80\ \text{MPa}$$



$$\frac{5561\ \text{gf}}{2.7 \times 3.1\ \text{mm}^2} = 6.4\ \text{MPa} \qquad \frac{5460\ \text{gf}}{2.7 \times 1.61\ \text{mm}^2} = 12.31\ \text{MPa}$$

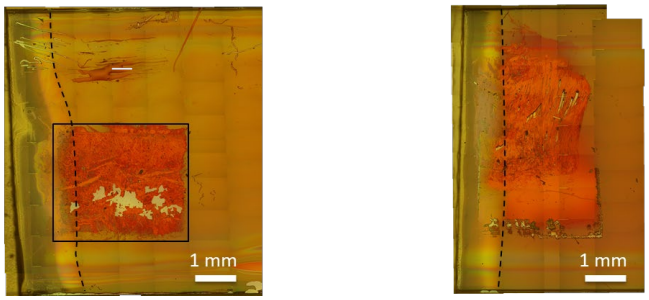


Figure S4. Images of the stressed region for moving front experiments. It shows that external pressure of 2.8 MPa is the lower limit to stop the diffusion. Dashed lines show the front position at the pressure-free regions.

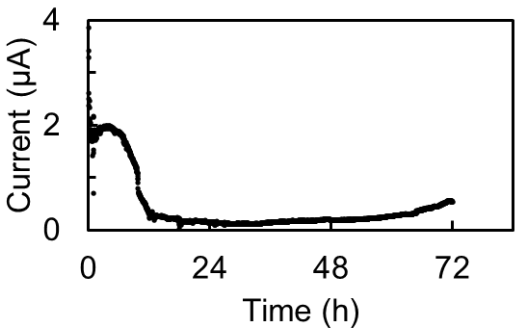


Figure S5. Current in the PProDOT film measured as a function of time. 0 refers to the time when the moving front enters the stressed region.

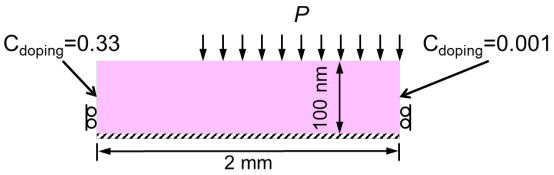


Figure S6. The geometry and boundary conditions of the finite element model.

Table S1. Front width calculated for different values of f_C

f_C	Front width at 2 h [μm]	$\frac{D_0(\text{doped})}{D_0(\text{undoped})}$
0	784	1
21	280	10
42	81	100
53	43	300
63	23	1000

Table S2. Material parameters for finite element modeling

Properties	De-doped	Doped
Ion concentration C [mol · m^{-3}]	1	1372
Young's modulus E [MPa]	1150	650
Yield strength Y[MPa]	35.07	11.46
Poisson's ratio ν	0.3	
Partial molar volume Ω [m^{-3} · mol]	1.46×10^{-4} (assuming 20% swelling)	
Applied pressure P[MPa]	2.8	