Supplemental Information for

The effect of rigid-block length in elastomer-containing photoactive block copolymers on the photovoltaic and mechanical properties of polymer solar cells

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Experimental Section

Materials: Carbinol-terminated polydimethylsiloxane (PDMS, number-average molecular weight $(M_n) = 9.3 \text{ kg mol}^{-1}$ polymers were purchased from Gelest Co. The M_n value of PDMS polymers was obtained by performing gel permeation chromatography (GPC) measurements at 140 °C using 1,2,4-trichlorobenzene as an eluent. 5-Bromothiophene-2-carboxylic acid, 1-(3-dimethylaminopropyl)-3-ethylcarbodiimide hydrochloride (EDC), tris(dibenzylideneacetone)dipalladium(0)-chloroform adduct (Pd₂(dba)₃·CHCl₃), tris(otolyl)phosphine (P(o-tol)₃) and all solvents used for reactions were purchased from Sigma-Aldrich and used without further purification. 4,8-Bis(5-(2-ethylhexyl)-4-fluorothiophen-2yl)benzo[1,2-*b*:4,5-*b*']dithiophene-2,6-diyl)bis(trimethylstannane) (BDTF-Sn), 5,8dibromodithieno[3',2':3,4;2",3":5,6]benzo[1,2-*c*][1,2,5]thiadiazole (DTBT-Br), and 2,2'-((2Z,2'Z)-((3,9-bis(2-butyloctyl)-12,13-bis(2-ethylhexyl)-12,13-dihydro-[1,2,5]thiadiazolo[3,4-e]thieno[2",3":4',5']thieno[2',3':4,5]pyrrolo[3,2-

g]thieno[2',3':4,5]thieno[3,2-b]indole-2,10-diyl)bis(methaneylylidene))bis(5,6-difluoro-3-

oxo-2,3-dihydro-1H-indene-2,1-diylidene))dimalononitrile (L8-BO) were purchased from Derthon Optoelectronic Materials Science Technology Co



Scheme S1. Synthetic scheme for PDMS-2Br.

Synthesis of PDMS-2Br

Carbinol-terminated polydimethylsiloxane (10 g, 0.8 mmol), 5-bromothiophene-2-carboxylic acid (0.83 g, 3.2 mmol), EDC (0.77 g, 3.2 mmol), and DMAP (0.49 g, 3.2 mmol) were dissolved by 50 mL of N,N-dimethylformamide (DMF) and 25 mL of dichloromethane (DCM) in a 250 mL round-bottom flask under N₂ condition. The reaction mixture was then stirred for 2 days at room temperature. Then, the organic phase was washed with deionized water (DI-water), extracted with chloroform, dried with anhydrous MgSO₄, and filtered. The residual solvent was evaporated using a rotary evaporator. The crude product was purified with column chromatography on silica gel using n-hexane/DCM mixture (7:3, v/v) as eluent to yield the pure compound as a colorless liquid (5.62 g, 67%). ¹H NMR spectrum is shown in **Figure S2**.

PDMS-2Br $M_n = 9.3 \text{ kg mol}^{-1}$, D = 1.3.

¹H NMR (400 MHz, Chloroform-d) δ 7.59 (d, J = 4.0 Hz, 1H), 7.09 (d, J = 4.0 Hz, 1H), 5.32 (s, 0H), 4.49 – 4.38 (m, 2H), 3.80 – 3.68 (t, 2H), 3.48 (t, J = 7.1 Hz, 2H), 1.75 – 1.54 (m, 4H), 1.36 – 1.25 (m, 10H), 0.91 (t, J = 6.7 Hz, 8H), 0.60 – 0.53 (m, 2H), 0.36 – 0 (m, 766H).



Scheme S2. Synthetic scheme for D18.

Synthesis of D18

In a 20 mL vial, BDTF-Sn (108.8 mg, 0.12 mmol), DTBT-Br (100 mg, 0.11 mmol), $Pd_2(dba)_3$ ·CHCl₃ (1.2 mg, 0.0012 mmol), and P(*o*-tol)₃ (1.4 mg, 0.0048 mmol) were dissolved in dry toluene (1.6 mL) under N₂ condition. The polymerization was conducted at 110 °C for 30 min. The crude polymer was precipitated in methanol and purified through Soxhlet extraction. The polymer was sequentially washed with methanol, acetone, n-hexane, and chloroform, chlorobenzene, and extracted from the *ortho*-dichlorobenzene. The final product was precipitated in methanol and dried under a vacuum. ¹H NMR spectrum is shown in **Figure S3**.

D18 $M_{\rm n}$ = 42.4 kg mol⁻¹, D = 3.1.

¹H NMR (400 MHz, 1,2-dichlorobenzene- d_4 , 120 °C) : 7.90 (br, aromatic protons), 7.38 (br, aromatic protons), 7.30 (br, aromatic protons), 7.22 – 7.16 (br, aromatic protons), 2.92 – 2.86 (br, aliphatic protons), 1.92 – 1.78 (br, aliphatic protons), 1.45 – 1.36 (br, aromatic protons), 1.29 – 0.82 (br, aromatic protons).



Scheme S3. Synthetic scheme for random copolymerization.

Synthesis of D18-r-PDMS

In a 20 mL vial, BDTF-Sn (108.8 mg, 0.12 mmol), DTBT-Br (100 mg, 0.11 mmol), PDMS-2Br (60.3 mg, 0.01 mmol), $Pd_2(dba)_3$ ·CHCl₃ (1.2 mg, 0.0012 mmol), and $P(o-tol)_3$ (1.4 mg, 0.0048 mmol) were dissolved in dry toluene (2 mL) under N₂ condition. The polymerization was conducted at 110 °C for 30 min. The crude polymer was precipitated in methanol and purified through Soxhlet extraction. The polymer was sequentially washed with methanol, acetone, n-hexane, chloroform, chlorobenzene and extracted from the *ortho*-dichlorobenzene.

The final product was precipitated in methanol and dried under a vacuum. ¹H NMR spectrum is shown in **Figure S3**.

D18-*r*-PDMS $M_n = 62.3 \text{ kg mol}^{-1}$, D = 2.8.

¹H NMR (400 MHz, 1,2-dichlorobenzene-*d*₄, 120 °C) : 7.97 – 7.40z (br, aromatic protons), 7.32z (br, aromatic protons), 7.01z (br, aromatic protons), 2.90 – 1.94z (br, aliphatic protons), 1.59 – 1.19 (br, aliphatic protons), 1.10 – 0.80 (br, aliphatic protons), 0.39 – 0.08 (br, aliphatic protons).



Scheme S4. Synthetic scheme for block copolymerization.

Synthesis of D18_L-b-PDMS, D18_M-b-PDMS and D18_H-b-PDMS

In three 20 mL vials (denoted as reactors V1), BDTF-Sn (108.8 mg, 0.12 mmol), DTBT-Br (100 mg, 0.11 mmol), Pd₂(dba)₃·CHCl₃ (0.8 mg, 0.0008 mmol), and P(o-tol)₃ (0.9 mg, 0.0032mmol) were dissolved in dry toluene (1.6 mL) under N₂ condition. In another 20 mL vial (denoted as reactor V2), PDMS-2Br (200 mg, 0.02 mmol) was dissolved in dry toluene (2 mL) and stirred for 30 min under N₂ condition. Each mixture in reactor V1 was stirred at 110 °C for 9 min, 15 min, and 18 min to polymerize **D18_L-Sn**, **D18_M-Sn**, and **D18_H-Sn** respectively. Then, a small portion of solutions from reactor V1 were extracted for further characterization. Afterward, 0.60ml of the solution in reactor V2 was sequentially transferred to reactor V1 using a syringe. The combined mixtures in corresponding reactors V1 of **D18_L-b-PDMS**, **D18_M-b-PDMS**, and **D18_H-b-PDMS** were further stirred at 110 °C for another 21 min, 15 min, and 12 min respectively. The precipitation and purification processes are identical to those of **D18**. ¹H NMR spectra of synthesized polymers are shown in **Figure S3**.

 $D18_{\rm L}$ -Sn $M_{\rm n} = 8.6 \text{ kg mol}^{-1}$, D = 2.4

 $D18_{\rm M}$ -Sn $M_{\rm n} = 14.4 \text{ kg mol}^{-1}$, D = 3.1

 $D18_{\rm H}$ -Sn $M_{\rm n} = 22.6 \text{ kg mol}^{-1}, D = 3.6$

D18_L-*b*-PDMS $M_n = 58.5 \text{ kg mol}^{-1}$, D = 2.5.

D18_M-*b*-PDMS $M_n = 65.6 \text{ kg mol}^{-1}$, D = 2.7.

D18_H-*b*-PDMS $M_{\rm n} = 68.3 \text{ kg mol}^{-1}$, D = 2.5.

¹H NMR (400 MHz, 1,2-dichlorobenzene- d_4 , 120 °C) : 7.97 – 7.40z (br, aromatic protons), 7.32z (br, aromatic protons), 7.01z (bar, aromatic protons), 2.90 – 1.94z (br, aliphatic protons), 1.59 – 1.19 (br, aliphatic protons), 1.10 – 0.80 (br, aliphatic protons), 0.39 – 0.08 (br, aliphatic protons).

Estimation of Num^{PDMS}/ *Num*^{D18} *in D18_x-b-PDMS:* We calculated the Num^{PDMS}/ Num^{D18} values of the block copolymers using their NMR and GPC results (Scheme S5). Initially, we determined the molar ratios of the D18 (i.e. BDT-DTBT-BDT repeating unit) and PDMS segments in the block copolymers by comparing the peak area of D18 and PDMS in the NMR spectra of the block copolymers. Specifically, the molar ratio for the D18 segment was calculated based on the signals from 1.59 to 1.19 ppm and 1.10 to 0.80 ppm, which corresponds to the protons located after the branching points of the side chains in the BDT and DTBT units. The molar ratio for the PDMS segment was derived from the signal at 0.39 ppm to 0.08 ppm, which corresponds to the methyl protons attached to silicon atoms. We then calculated the weight percentages of D18 and PDMS using molecular weights of the monomer units (**Eqn. 1** and **2**). For instance, the weight percentage of D18 was estimated to 85.6%, and that of PDMS was 14.5% in the D18_H-*b*-PDMS sample.

$$D18 \text{ wt\%} = \frac{(BDT-DTBT-BDT \text{ Weight}) \times D18 \text{ molar ratio}}{(BDT-DTBT-BDT \text{ Weight}) \times D18 \text{ molar ratio} + (PDMS \text{ Weight}) \times PDMS \text{ molar ratio}} \times 100 \text{ (Eqn. 1)}$$

$$PDMS \text{ wt\%} = \frac{(PDMS \text{ Weight}) \times PDMS \text{ molar ratio}}{(BDT-DTBT-BDT \text{ Weight}) \times D18 \text{ molar ratio} + (PDMS \text{ weight}) \times PDMS \text{ molar ratio}} \times 100 \text{ (Eqn. 2)}$$

Next, we incorporated the GPC profiles of $D18_x$ -*b*-PDMS to estimate the net weights of D18 and PDMS segments in the block copolymers. Specifically, by multiplying the M_n of $D18_x$ -*b*-PDMS by the weight percentages previously obtained, we calculated the net weights of the D18 and PDMS components within each copolymer (**Eqn. 3** and **4**). For example, the net D18 weight of $D18_H$ -*b*-PDMS was calculated to be 58.4 kg mol⁻¹ and the net PDMS weight to be 9.9 kg mol⁻¹.

Net D18 weight =
$$M_n$$
 of D18_x-*b*-PDMS × D18 weight % (Eqn. 3)

Net PDMS weight = M_n of D18_x-*b*-PDMS × PDMS weight % (Eqn. 4)

Finally, we divided the net weight of each constituent by its block M_n obtained from GPC to obtain the Num^{PDMS}/ Num^{D18} value (**Eqn. 5**). As a result, the Num^{PDMS}/ Num^{D18} values for D18_L-*b*-PDMS, D18_M-*b*-PDMS, and D18_H-*b*-PDMS were 0.58, 0.50, and 0.41, respectively.





Scheme S5. Calculation procedure for the Num^{PDMS}/ Num^{D18} ratios of D18_{L,M,H}-*b*-PDMS.

Characterizations: Proton nuclear magnetic resonance (¹H NMR) spectra of synthesized polymers were obtained by a Bruker AVANCE III HD Nanobay spectrometer (400 MHz) using 1,2-dichlorobenzene- d_4 as a solvent at 120 °C. The molecular weight of the polymers was estimated by high-temperature GPC at 140 °C using 1,2,4-trichlorobenzene as an eluent, which

was calibrated using polystyrene standards. UV–Vis absorption spectra were obtained using a UV-1800 spectrophotometer (Shimadzu Scientific Instruments). Cyclic voltammetry (CV) curves were obtained using a common three-electrode system from an EG and G Parc model 273 Å system. Thermo gravimetric analysis (TGA) was performed using TGA N-1000 (SCINCO Co.). Force-distance curves were acquired by a Park NX10 using Park System's PinPoint Nanomechanical measurement mode.

OSC Fabrication and Characterization: The OSCs with a normal architecture (ITO/ PEDOT:PSS/ layer/poly[[2,7-bis(2-ethylhexyl)-1,2,3,6,7,8-hexahydro-1,3,6,8active tetraoxobenzo[lmn][3,8]phenanthroline-4,9-diyl]-2,5-thiophenediyl[9,9-bis[3'((N,Ndimethyl)-N-ethylammonium)]-propyl]-9H-fluorene-2,7-diyl]-2,5-thiophenediyl] (PNDIT-F3B-Br)/Ag) were prepared with the following procedures. ITO-coated glass substrates were treated by ultrasonication with deionized water, acetone, and isopropyl alcohol. Then, the ITO substrates were dried for 6 h in an oven (70 °C) at ambient pressure, and then plasma treated for 10 min. Spin-coating of the PEDOT:PSS solution (Clevios, AI4083) was performed at 4000 rpm for 30 sec onto the ITO substrates. Then, the film/substrate was annealed in the air at 150 °C for 15 min before transferring into an N₂-filled glovebox. The active layer solution was prepared by dissolving each polymer donor and small molecule acceptor (SMA) together in chloroform with an optimized condition (donor: acceptor blend ratio = 1:1, concentration = 12mg mL⁻¹) with 1,4-diiodobenzene (50 wt% to the total donor + acceptor weight) additive. The solution sealed with Teflon tape was stirred on a 90 °C plate for 6 h. The solution was spincoated onto the PEDOT:PSS/ITO substrate to form an active layer with a thickness of ~120 nm. Then, the samples were dried with high vacuum ($< 10^{-6}$ torr) for 1 h and annealed at 90 °C for 3 min. PNDIT-F3B-Br in methanol (1 mg m L^{-1}) was then spin-coated with the condition of 3000 rpm for 30 sec. Finally, Ag (120 nm) was deposited under high vacuum (~ 10^{-6} Torr) in an evaporation chamber. Optical microscopy (OM) was used to measure the exact photoactive area of the mask (0.04 cm²). Keithley 2400 SMU instrument was used to measure the power conversion effcieincy values under an Air Mass 1.5 G solar simulator (100 mW cm⁻², solar simulator: K201 LAB55, McScience), satisfying the Class AAA, ASTM Standards. K801SK302 of McScience was used as a standard silicon reference cell to calibrate the exact solar intensity. The average measurement duration for each OSC device was 5.9 s. K3100 IQX (McScience Inc. Instrument) was used to obtain the external quantum efficiency (EQE) spectra, equipped with a monochromator (Newport) and an optical chopper (MC 2000 Thorlabs).

Pseudo Free-Standing Tensile test: In the pseudo free-standing tensile method, the films were prepared with the same condition as the organic solar cell (OSC) fabrications. The films were spin-casted onto the polystyrene sulfonic acid-coated glass substrate, and cut into a dog-bone shape by a femtosecond laser. Then, the films were floated onto the water surface, and attached to the grips by van der Waals forces. The strain was applied at a fixed strain rate $(0.8 \times 10^{-3} \text{ s}^{-1})$, and the tensile load values were measured by a load cell with high resolution (LTS-50GA, KYOWA, Japan). Elastic modulus was calculated using the least square method for the slope of the linear region of the stress-strain curve within 1 % strain.

IS-OSC Fabrication: Normal-type IS-OSCs with a device configuration of thermoplastic polyurethanes (TPU)/modified PH1000/AI4083/photoactive layers/PNDITF3N-Br/eutectic gallium indium (EGaIn) were fabricated. The modified PH1000 solution was prepared to contain 5 vol% of dimethyl sulfoxide (DMSO) in order to enhance electrical conductivity of PH1000, 2 vol% of polyethylene glycol in order to improve mechanical stretchability, and 0.5

vol% of Zonyl fluoro surfactant (FS-30) in order to enhance surface wettability. This modified solution was then spin-coated onto the plasma-treated TPU substrate at 1200 rpm for 40 s and subsequently baked for 20 min at 100 °C in air. Afterward, an AI4083 hole transporting layer with 0.5 vol% FS-30 was spin-coated at 2500 rpm for 40 s onto the PH1000/TPU substrate and dried at 100 °C for 20 min. The photoactive layers were then spin-coated under the same conditions used for the OSC fabrication on the rigid ITO/glass substrate. Then, the PNDITF3N-Br solution in methanol at a concentration of 1 mg mL⁻¹ was spin-coated at 2000 rpm for 40 s, forming a 5 nm thick electron transporting layer on the active layer. Finally, EGaIn liquid metal was sprayed on the layer through a deposition mask. The photovoltaic performance of IS-OSCs was assessed using the same equipment utilized for evaluating the performance of the rigid OSCs.

Resonant soft X-ray scattering (RSoXS) measurement: RSoXS data were collected at the 11.0.1.2 beamline of the Advanced Light Source (Berkeley, USA). The blend films were fabricated using spin casting under optimized conditions and applied to a PSS-coated glass substrate. Subsequently, these films were transferred onto Si₃N₄ (100 nm thick), supported by silicon frames of 200 μ m in thickness and 5 mm × 5 mm in dimensions. Scattering profiles were observed over a *q*-range of 0.001–0.05 Å⁻¹ and at beam energies ranging from 283 to 286 eV. Despite the variation in beam energies, we did not detect any discernible phase separation or scattering contrast between the D18 and PEHDT constituents. We focused our analysis on profiles captured at a beam energy of 285.2 eV, where we observed the highest scattering contrast between the *P*_{DS} and SMA constituents.

Supplemental Figures & Tables



Figure S1. GPC profiles of polymers measured at 140 °C using 1,2,4-trichlorobenzene as an eluent.



Figure S2. ¹H NMR spectrum of PDMS-2Br in chloroform-d.



Figure S3. ¹H NMR spectra of D18, D18_L-*b*-PDMS, D18_M-*b*-PDMS, D18_H-*b*-PDMS, D18-*r*-PDMS, and D18:PDMS in 1,2-dichlorobenzene- d_4 at 120 °C.

Polymer	H ^{D18} a	¹ H ^{PDMS b}	BDT-DTBT units molar ratio 1 (%)	Si-O units nolar ratio (%)	Num ^{D18 block c}	Num ^{PDMS block d}
D18 _L - <i>b</i> -PDMS	1	0.75	10.5	89.5		0.58
D18 _M - <i>b</i> -PDMS	1	0.38	17.5	82.5	1	0.50
D18 _H - <i>b</i> -PDMS	1	0.20	25.9	74.1	1	0.41
D18-r-PDMS	1	0.47	15.1	84.9		-

Table S1. The molar ratio of constituents in D18-*b*-PDMS calculated by the integrated value of ¹H NMR spectra.

^aThe sum of the integrated value from 1.59 ppm to 1.19 ppm and from 1.10 ppm to 0.80 ppm in Figure S3 ¹H NMR spectra normalized as 1 ^bThe sum of the integrated value from 0.39 ppm to 0.08 ppm in Figure S3 ¹H NMR spectra ^cThe number of D18 block in BCPs normalized as 1 ^dThe number of PDMS block normalized by D18 block in BCPs.



Figure S4. TGA spectra of pristine D18, pristine PDMS-2Br, D18-*r*-PDMS, and D18_{L,M,H}-*b*-PDMS from 25 to 800 °C with the rate of 5 °C/min.

Polymer	wt% at 750 °C	wt ^{D18} %	wt ^{PDMS-2Bro} ⁄o a	BDT-DTBT units molar ratio (%)	Si-O units molar ratio (%)
D18	4.7	100	0	100	0
PDMS-2Br	30.9	0	100	0	100
D18-r-PDMS	11.6	73.7	26.3	13.2	86.8
D18:PDMS	10.8	76.7	23.3	15.2	84.8
D18 _L - <i>b</i> -PDMS	12.9	68.7	31.3	10.7	89.3
D18 _M - <i>b</i> -PDMS	9.8	80.5	19.5	18.3	81.6
D18 _H - <i>b</i> -PDMS	8.1	87.3	12.7	27.2	72.8

Table S2. Weight^{D18} (%) and Weight^{PDMS-2Br}(%) of pristine D18, pristine PDMS-2Br, D18-*r*-PDMS, D18:PDMS, and D18_{L,M,H}-*b*-PDMS using TGA results.

The wt% of PDMS blocks in D18_x-*b*-PDMS P_{DS} were calculated based on the fact that neat D18 and PDMS components undergo a different amount of weight losses at 750 °C. ^aWeight^{PDMS-2Br} (%) was calculated using the following equation : Weight (%) at 750 °C = Weight^{Pristine D18} (%) at 750 °C ×(1–Weight^{PDMS-2Br} (%)) + Weight^{Pristine PDMS} (%) at 750 °C ×Weight^{PDMS-2Br} (%).



Figure S5. Solubility of the D18-*r*-PDMS, D18_L-*b*-PDMS, D18_M-*b*-PDMS, D18_H-*b*-PDMS, and D18 (from left to right) in chloroform solution at room temperature.



Figure S6. Cyclic voltammograms of the *P*_Ds.



Figure S7. Temperature dependent UV-Vis absorption spectra of P_Ds in CF solution.



Figure S8. GIXS 2D-image of L8-BO and PDMS.



Figure S9. GIXS linecut profiles in the in-plane direction (q_{xy}) and out-of-plane (q_z) of L8-BO and PDMS.

PD	d (100) ^{IP} (Å)	$L_{c (100)}^{IP}$ (nm)	d ₍₀₁₀₎ OOP (Å)	L _{c (010)} ^{OOP} (nm)
D18	21	12.0	3.8	3.2
D18 _L - <i>b</i> -PDMS	21	12.4	3.8	3.6
D18 _M - <i>b</i> -PDMS	21	14.1	3.8	3.8
D18 _H - <i>b</i> -PDMS	20	14.2	3.7	3.3
D18-r-PDMS	21	8.8	3.8	2.4
D18:PDMS	21	11.8	3.8	3.5

Table S3. GIXS *d*-spacing and L_c values of pristine P_{DS} .



Figure S10. Force-distance curves of pristine *P*_Ds.

Material	$\mu_{\rm h} ({\rm cm}^2 {\rm V}^{-1} {\rm s}^{-1})^{\rm a}$	$\mu_{\rm e} ({\rm cm}^2{\rm V}^{-1}{\rm s}^{-1})^{{\rm a}}$
D18	4.8×10^{-4}	_
D18 _L - <i>b</i> -PDMS	1.3×10^{-4}	_
D18 _M - <i>b</i> -PDMS	3.4×10^{-4}	_
D18 _H - <i>b</i> -PDMS	4.0×10^{-4}	_
D18-r-PDMS	$6.8 imes 10^{-5}$	_
D18:PDMS	2.3×10^{-5}	_
L8-BO	_	$4.7 imes 10^{-4}$

Table S4. SCLC mobilities for the pristine P_D and SMA constituent films.

^aAveraged values from 3 independent devices.



Figure S11. PCE distributions of *P*_D:L8-BO OSCs.

Material	$\mu_{\rm h} ({\rm cm}^2 {\rm V}^{-1} {\rm s}^{-1})^{\rm a} \mu_{\rm e} ({\rm cm}^2 {\rm V}^{-1} {\rm s}^{-1})^{ {\rm a}}$			
D18	4.4×10^{-4}	4.7×10^{-4}		
D18 _L - <i>b</i> -PDMS	9.4×10^{-5}	4.1×10^{-4}		
D18 _M - <i>b</i> -PDMS	$1.9 imes 10^{-4}$	4.5×10^{-4}		
D18 _H - <i>b</i> -PDMS	3.6×10^{-4}	4.4×10^{-4}		
D18-r-PDMS	5.1×10^{-5}	3.8×10^{-4}		
D18:PDMS	$1.8 imes 10^{-5}$	4.9×10^{-5}		

Table S5. SCLC mobilities for the *P*_D:SMA blend films.

^aAveraged values from 3 independent devices.



Figure S12. a) Stress-strain curve, b) OM image of D18-*r*-PDMS: L8-BO blend film.



Figure S13. a) *J-V* curves of D18:L8-BO- and D18_H-*b*-PDMS:L8-BO-based IS-OSCs; b) PCE and c) normalized PCE values of D18:L8-BO- and D18_H-*b*-PDMS:L8-BO-based IS-OSCs at different strains.

Table S6. Photovoltaic and mechanical properties the D18:L8-BO- and D18_H-*b*-PDMS:L8-BO-based IS-OSCs.

PD	V _{oc} (V)	J _{sc} (mA cm ⁻²)	FF	PCE _{max(avg)} ^a (%)	Strain at PCE80% (%)
D18	0.88	21.30	0.66	12.37 (12.04)	8
D18 _H - <i>b</i> -PDMS	0.87	20.62	0.66	11.90 (11.57)	16

^aAverage PCEs obtained from at least 3 independent devices for each active layer system.



Figure S14. GIXS 2D-images of the P_D :L8-BO blend films depending on the P_D types.