Electronic Supplementary Material (ESI) for Journal of Materials Chemistry C.

Supporting Information

Preparation of efficient oligomer-based bulk-heterojunction solar cells with eco-friendly solvents

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Table S1. .Overview of reported oligomer-based BHJSC with the respectively obtained PCEs using various halogen-free solvents.

Solvent	**Blend**	**PCE [%]**	**Reference**
Tetrahydrofuran	SM:$PC_{71}BM$	2.65	[1]
Benzaldehyde/mesitylene (80:20)	N(Ph-2T-DCN-Et)/$PC_{71}BM$	3.75	[2]
2-Methyltetrahydrofuran	X2:$PC_{61}BC_8$	5.10	[3]
o-Xylene + 1% MN	DPPEZnP-O:$PC_{61}BM$	5.85	[4]
Toluene	SMPV1:$PC_{71}BM$	7.04	[5]
Toluene/CPME (40:60)	SMPV1:$PC_{61}BM$	8.10	[6]
Carbon disulfide	BDTTNTTR: $PC_{71}BM$	10.02	[7]
Carbon disulfide	BDTSTNTTR: $PC_{71}BM$	11.53	[7]

Table S2. Solubility parameters and melting temperatures of co-oligomers **1-3** investigated in this study.

Oligomer	Solubility in chloroform [mg mL^{-1}]	Solubility in ethyl acetate [mg mL^{-1}]	Solubility in toluene [mg mL^{-1}]	Solubility in *o*-xylene [mg mL^{-1}]	T_m [°C][a]
1	15	7	2	>80	181
2	>120[b]	3	<1	26	183[b]

3	>80 [c]	3	<1	16	174[c]

[a]Melting temperatures (T_m) were determined using differential scanning calorimetry. [b]see ref. 8. [c]see ref. 9.

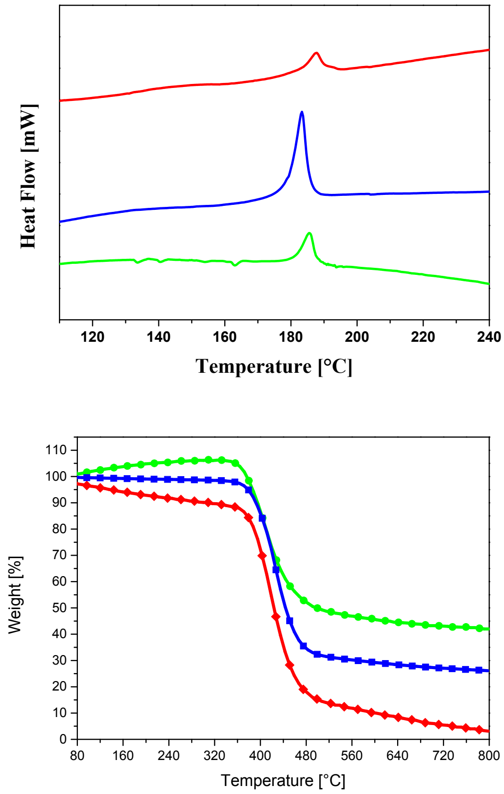

Figure S1. TGA and DSC traces of oligomers **1** (green curve), **2** (blue curve), and **3** (red curve).

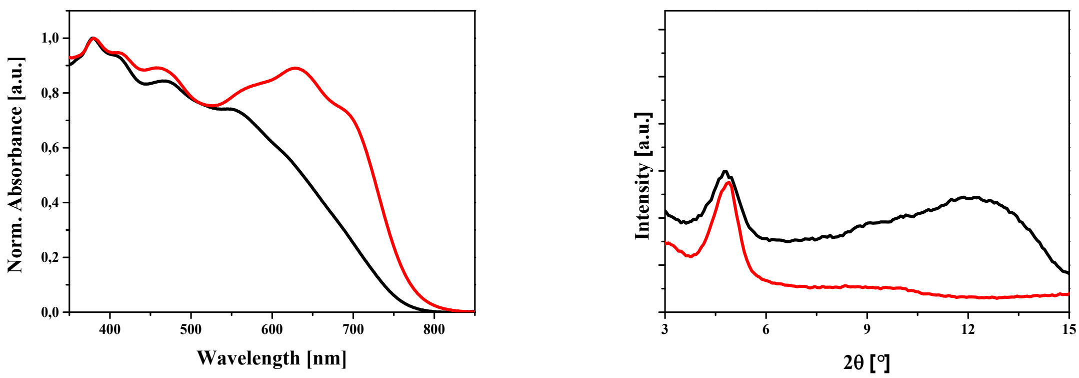

Figure S2. Absorption spectra (left) and GIXRD diffraction patterns (right) of blends containing co-oligomer **2** and $PC_{71}BM$ (1:2) before (black line) and after SVA (red line). The film was deposited by doctor-blading on a PEDOT:PSS coated glass substrate.

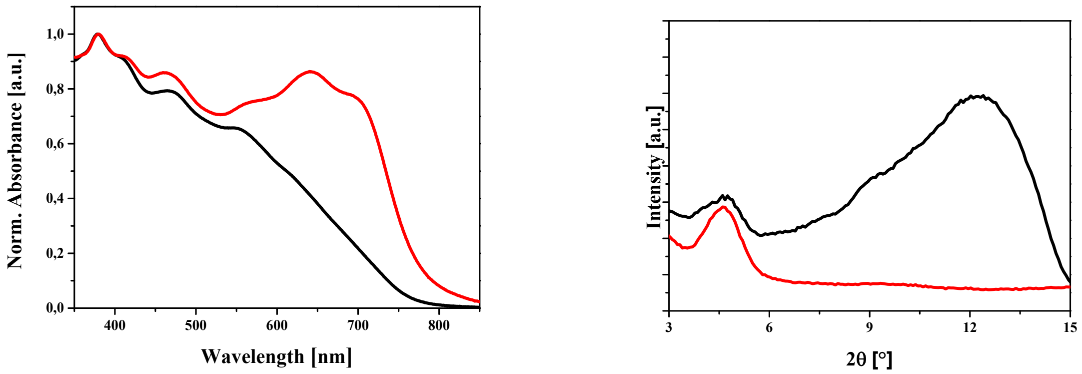

Figure S3. Absorption spectra (left) and GIXRD diffraction patterns (right) of blends containing co-oligomer **3** and $PC_{71}BM$ (1:2) before (black line) and after SVA (red line). The film was deposited by doctor-blading on a PEDOT:PSS coated glass substrate.

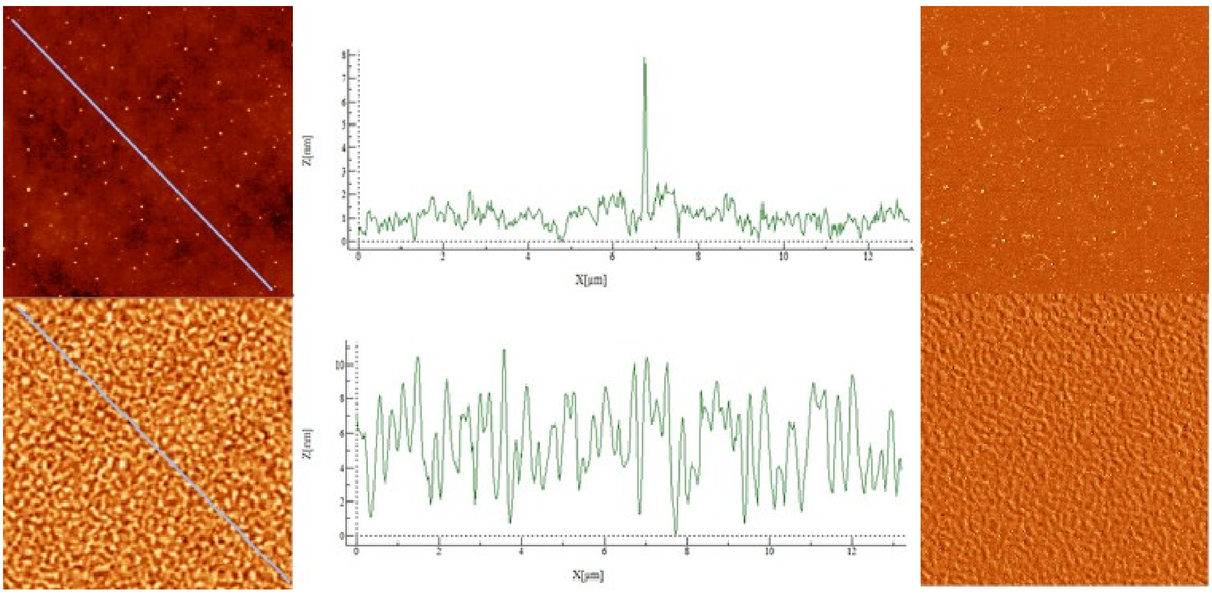

Figure S4. AFM images (10 × 10 µm^2) of the topography (Δz = 10 nm), height profile, and phase (Δθ = 20°) of the photoactive blend of **1**:$PC_{71}BM$ deposited by doctor-blading on PEDOT:PSS|glass before (top) and after (bottom) SVA. The average roughness before and after SVA treatment were determined to be 0.55 nm and 1.76 nm, respectively.

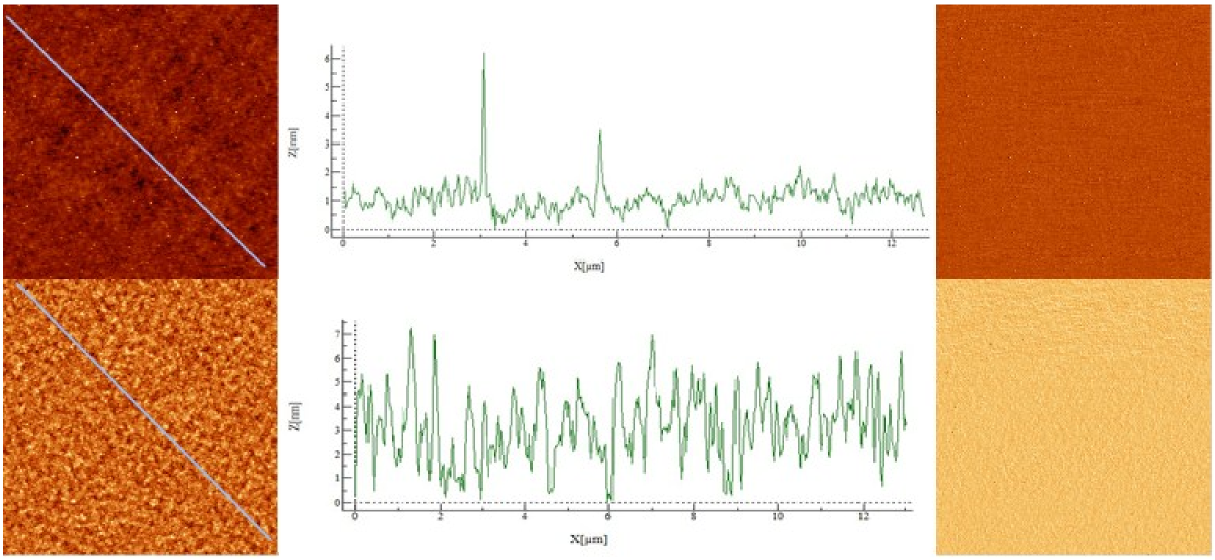

Figure S5. AFM images (10 × 10 µm²) of the topography (Δz = 10 nm), height profile, and phase (Δθ = 20°) of the photoactive blend of **2**:$PC_{71}BM$ deposited by doctor-blading on PEDOT:PSS|glass before (top) and after (bottom) SVA. The average roughness before and after SVA treatment were determined to be 0.31 nm and 1.10 nm, respectively.

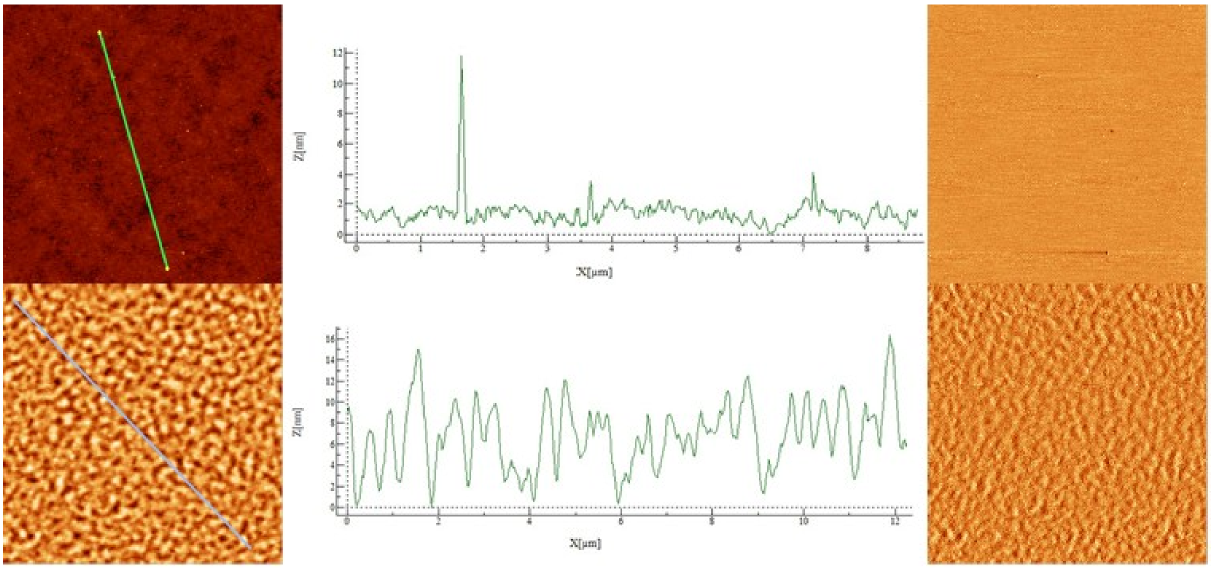

Figure S6. AFM images (10 × 10 µm²) of the topography (Δz=10 nm), height profile, and phase (Δθ = 20°) of the photoactive blend of **3**:$PC_{71}BM$ deposited by doctor-blading on PEDOT:PSS|glass before (top) and after (bottom) SVA. The average roughness before and after SVA treatment were determined to be 0.30 nm and 2.19 nm, respectively.

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