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Supplementary data

Optimizing the Doping Efficiency and Thermoelectric Properties of Isoindigo-Based Conjugated Polymers Using Side Chain Engineering

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S.1 Instrumentation

The thin film thicknesses were measured using an Alpha-Step® D-300 stylus profilometer (KLA-Tencor). UV–Vis absorption spectra were recorded on a Hitachi U-4100 spectrophotometer. Ultraviolet photoemission spectroscopy (UPS) and X-ray photoelectron spectroscopy (XPS) were measured using PHI 5000 VersaProbe III (ULVAC-PHI. Inc). Atomic force microscope (AFM) images were obtained using a Hitachi AFM5100N in tapping mode. The AFM tip radius is 10 nm, and the tip frequency is 70 kHz. Grazing-incidence wide-angle Xray scattering (GIWAXS) analysis was conducted at the Beamline TLS 13A1/17A1 and TPS 25A beamlines at National Synchrotron Radiation Research Center (NSRRC) in Taiwan. Contact angle images were measured using a Creating Nano Technology-CAM120.

Sample	<i>M_n</i> [kDa]	<i>M</i> _w [kDa]	PDI	<i>Т_d</i> [К]
P(Si-Si)	80	114	1.42	654
P(Si-O)	244	304	1.25	649
P(Si-F)	355	538	1.51	652

Table S1 Summary of the basic physical properties of the pristine P(Si-Si), P(Si-O), and (Si-F)

films.

Sample	$oldsymbol{ heta}_{water}$ [°]	θ _{glycerol} [°]	Surface energy	
			[mN m ⁻¹]	
P(Si-Si)	98.7	86.4	36.9	
P(Si-O)	84.8	76.2	28.5	
P(Si-F)	106.3	93.8	38.3	

Table S2 Summary of the contact angle of water and glycerol and surface energy of P(Si-Si), P(Si-

O) ,	and	P(Si-F).
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Fig. S1 XPS spectra of (a) P(Si-Si), (b) P(Si-O), and (c) P(Si-F) films before and after doping.



Fig. S2 Contact angle measurements of (a-c) water and (d-f) glycerol on P(Si-Si), P(Si-O), and

P(Si-F) coated surfaces.



Fig. S3 Azimuthal distribution of the polymer (100) peak of (a-c) the undoped and (d-f) doped

polymer films.



Fig. S4 (a-c) Out-of-plane and (d-f) in-plane line cut profiles of GIWAXS patterns obtained from

undoped and doped polymer films.



Fig. S5 (a-c) AFM height images and (d-f) current mapping of FeCl₃-doped polymer film.



Fig. S6 Comparison of the (a) *PF* versus σ and (b) *PF* versus *S* variation for donor-accepter

thermoelectric copolymers doped by FeCl_{3.}