

Supporting Information

Novel Polyelectrolytes Based on Naphthalene Diimide with Different Counteranions for Cathode Interlayers in Polymer Solar Cells

Rahmatia Fitri Binti Nasrun ^{1,2,†}, Dong Hwan Son ^{1,2,†} and Joo Hyun Kim ^{1,2,*}

¹ Department of Polymer Engineering, Pukyong National University, Busan 48513, Republic of Korea;

rahmatiaf@pukyong.ac.kr (R.F.B.N.); ehdghks507@naver.com (D.H.S.)

² CECS Research Institute, Core Research Institute, Busan 48513, Republic of Korea.

* Correspondence: jkim@pku.ac.kr

† These authors contributed equally to this work.

Keywords: polyelectrolytes; cathode interlayer; naphthalene diimide; polymer solar cell

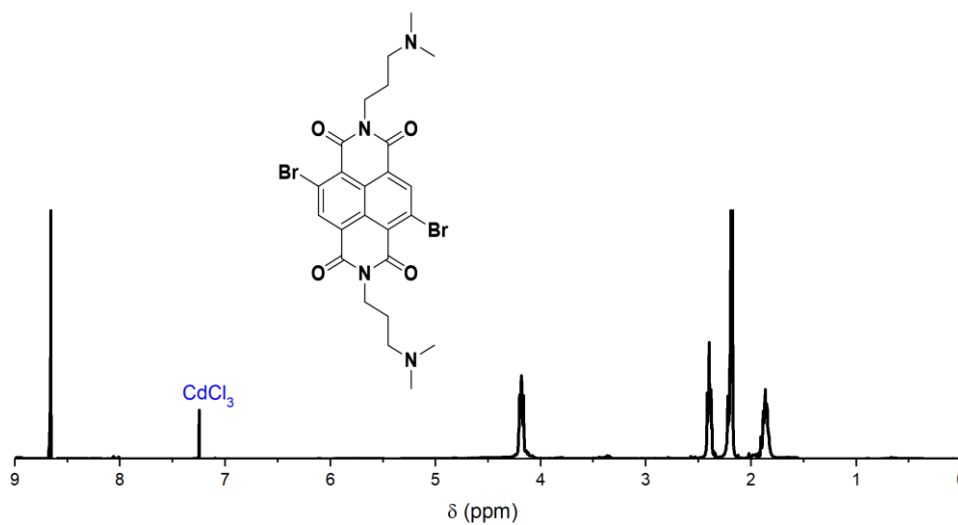
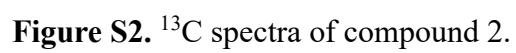


Figure S1. ¹H spectra of compound 2.



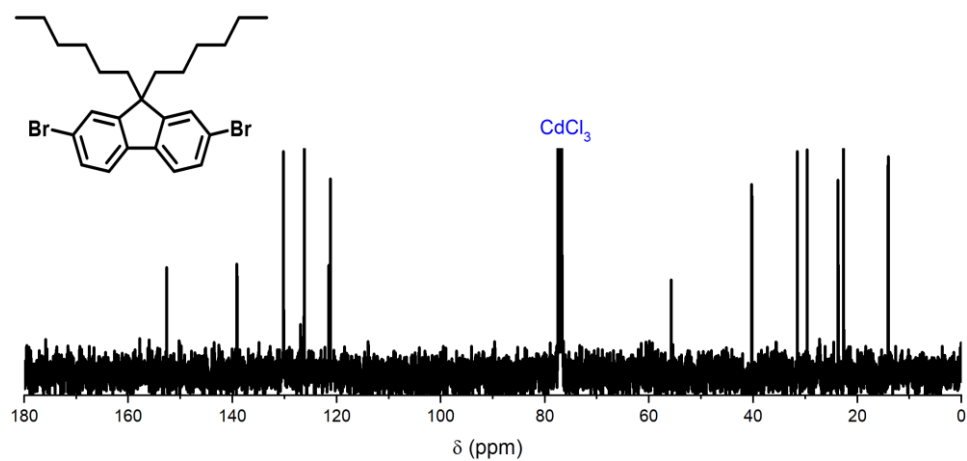


Figure S4. ^{13}C spectra of compound 3.

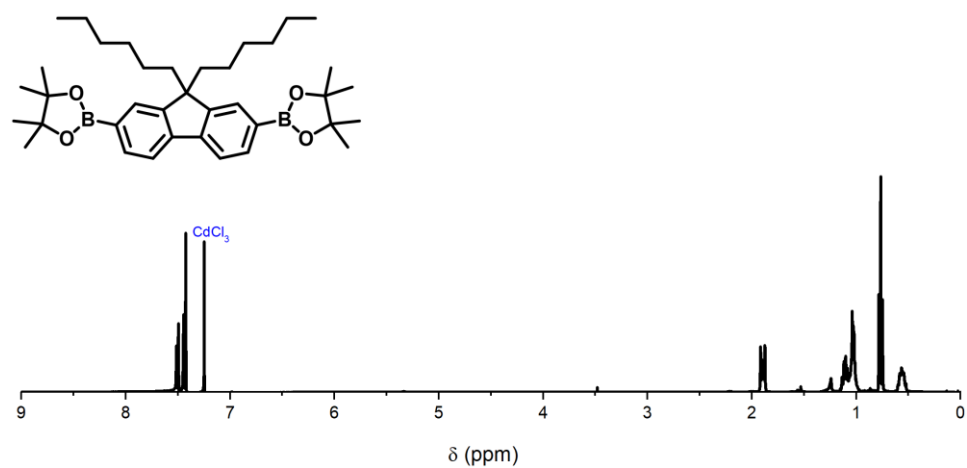


Figure S5. ^1H spectra of compound 4.

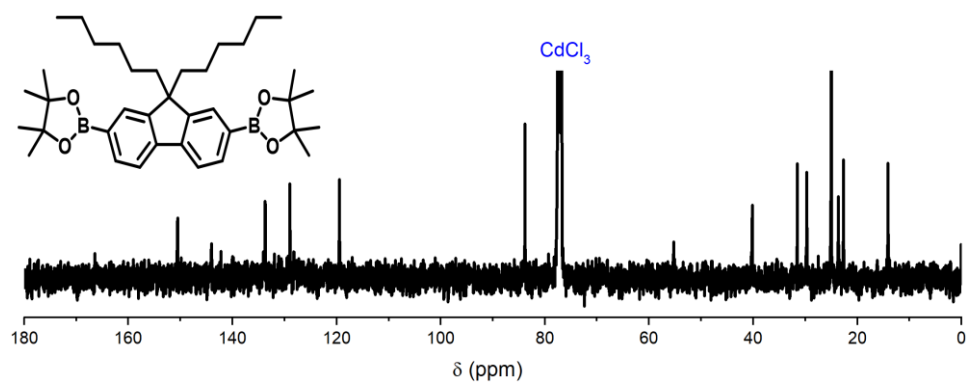


Figure S6. ^{13}C spectra of compound 4.

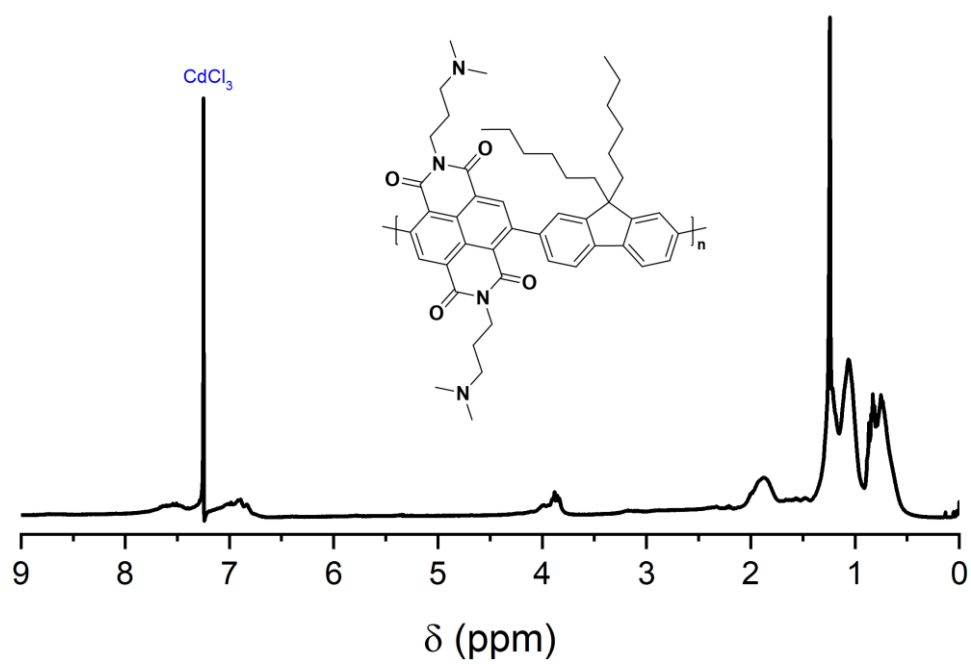


Figure S7. ^1H spectra of PF-NDIN.

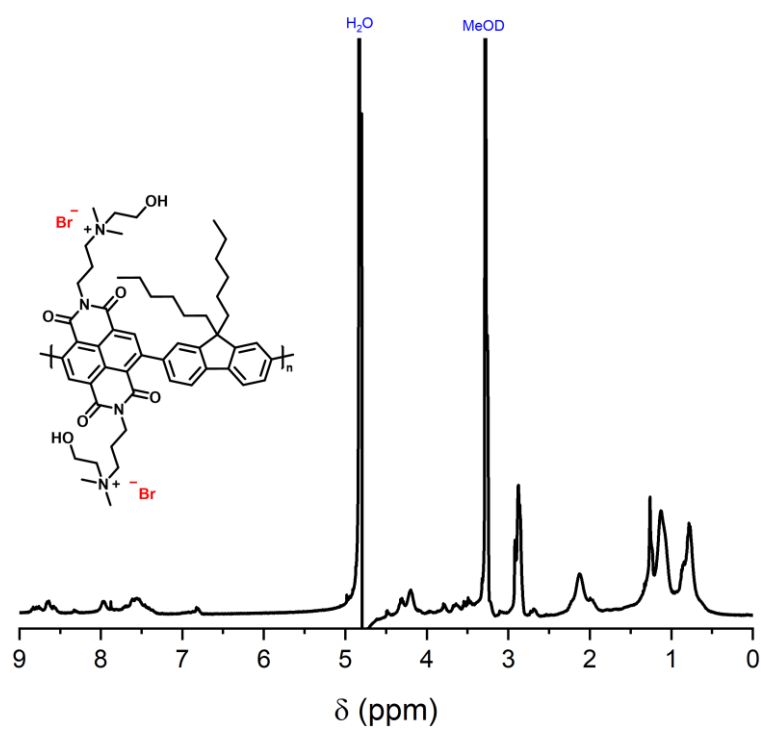


Figure S8. ^1H spectra of PF-NDIN-Br-OH.

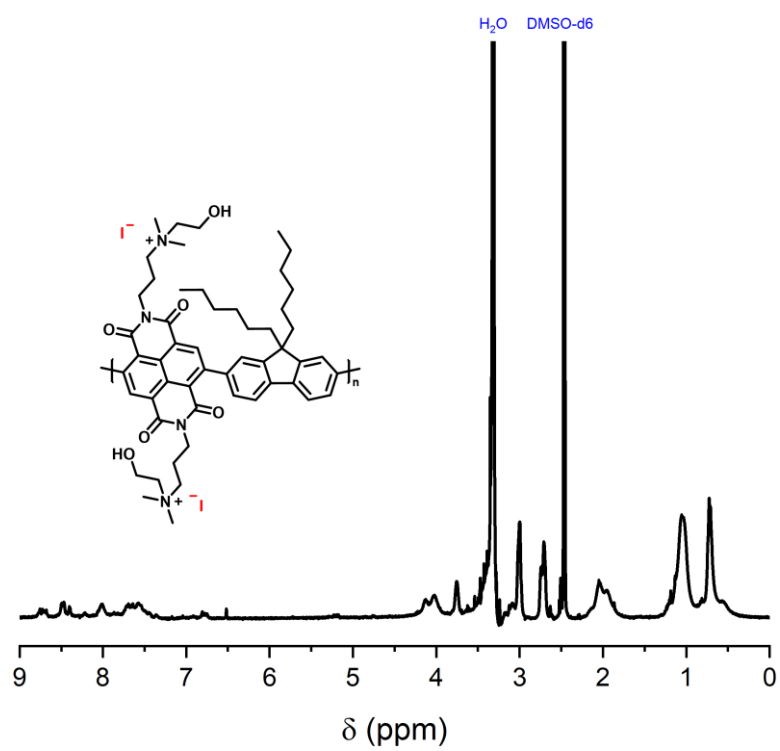


Figure S9. ^1H spectra of PF-NDIN-I-OH.

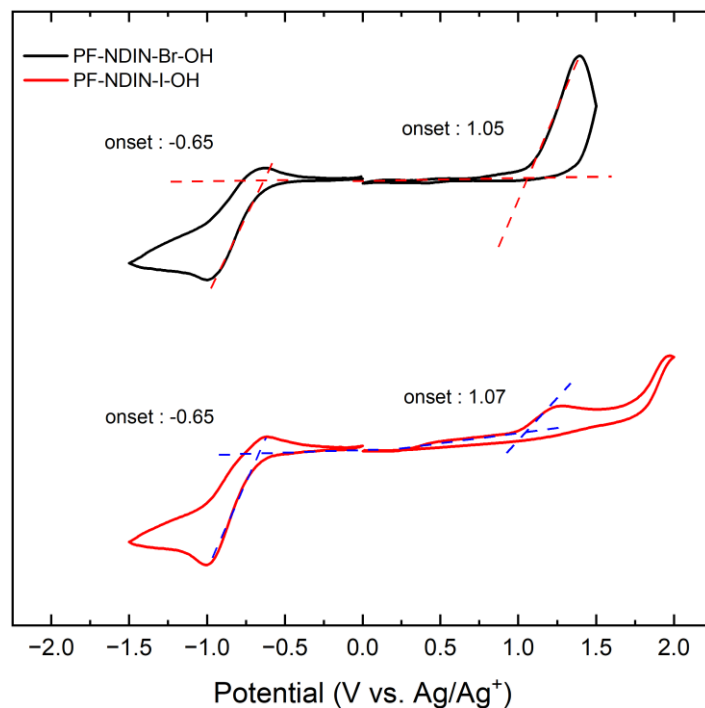


Figure S10. Cyclic voltammogram of polyelectrolytes.

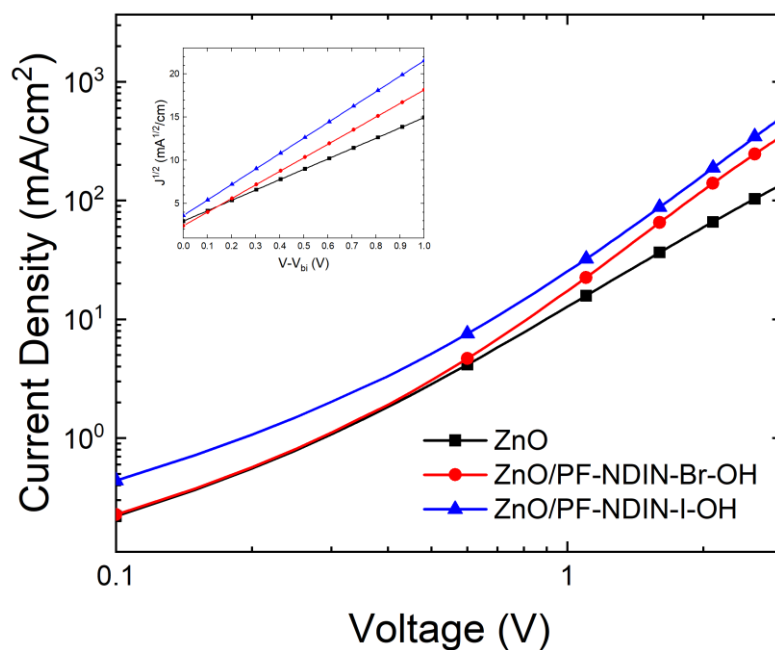


Figure S11. Current density–voltage curves of the electron-only devices with fitted line (V , applied voltage; V_{bi} , built-in voltage).

Table S1. The list of abbreviations in the paper

Word	Abbreviations
Polymer solar cells	PSCs
Power conversion efficiency	PCE
Short-circuit current	J_{sc}
Open-circuit voltage	V_{oc}
Fill factor	FF
Lowest unoccupied molecular orbital	LUMO
Highest occupied molecular orbital	HOMO
Poly([2,6'-4,8-di(5-ethylhexylthienyl)benzo[1,2-b;3,3-b]dithiophene]{3-fluoro-2[(2-ethylhexyl)carbonyl]thieno[3,4-b]thiophenediyl}))	PTB7-Th
(6,6)-Phenyl C71 butyric acid methyl ester	PC ₇₁ BM
Ultraviolet–visible	UV–Vis
Intramolecular charge transfer	ICT
Cyclic voltammogram	CV
Work function	WF
Incident photon-to-current efficiency	IPCE
Series resistance	R_s
Shunt resistance	R_{sh}
Photocurrent density	J_{ph}
Effective voltage	V_{eff}
Saturated photocurrent regime	V_{sat}
Saturation current density	J_{sat}
Maximum exciton generation rate	G_{max}

Electron charge	q
Thickness of the active layer	L
Electron mobility	μ_e
Light intensity	P_{light}
Electrochemical impedance spectroscopy	EIS
Recombination resistance	R_{rec}
