

## Supporting Information

### Cost-effective polymer donors with simple structure for organic solar cells

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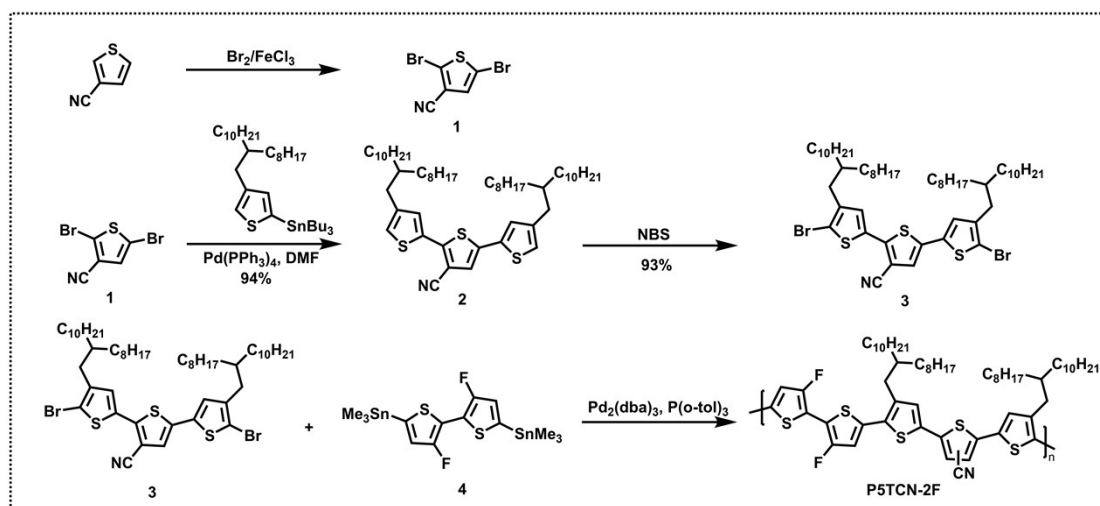
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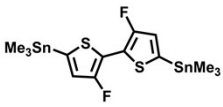
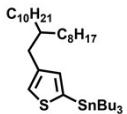

<sup>d</sup> Functional Laboratory of Solar Energy, Shandong Energy Institute, Qingdao 266101, China.

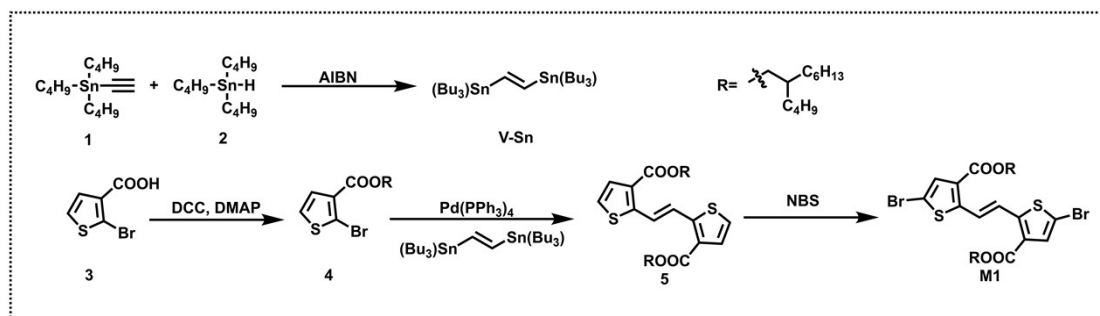
‡ Xue Zhou and Chuantao Gu contributed equally to this work.



**Figure S1.** The detailed synthetic route of each step of P5TCN-2F.<sup>1</sup>

**Table S1.** The MOC evaluation of P5TCN-2F.

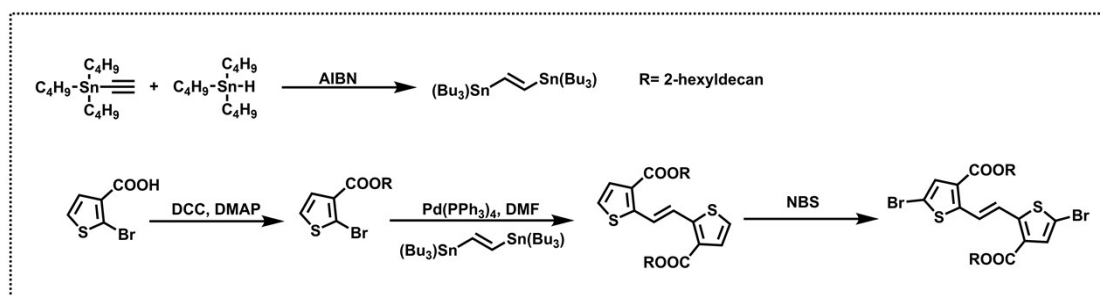
P5TCN-2F (1g)			
Reagent	Quantity	Unit	Cost(\$)
$\text{Pd}_2(\text{dba})_3$	0.021g	36.189\$/1g	0.760
$\text{P}(\text{o-tol})_3$	0.054g	4.954\$/5g	0.0534
	0.58g	468.115\$/5g	54.301
NBS	0.42g	2.752\$/25g	0.0462
	5.07g	6.605\$/5g	6.700
$\text{Pd}(\text{PPh}_3)_4$	0.15g	378.4\$/25g	2.270
DMF	27.62ml	2.752\$/100ml	0.760
$\text{FeCl}_3$	0.00414g	2.752\$/100g	0.000114
	0.19g	8.806\$/5g	0.335
Total Cost			65.226



**Figure S2.** The detailed synthetic route of each step of the acceptor unit of PTVT-T.<sup>2</sup>

**Table S2.** The MOC evaluation of the acceptor unit of PTVT-T.

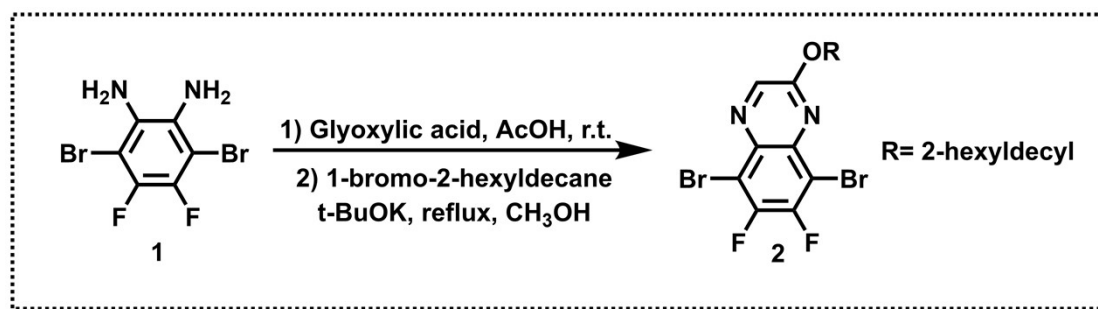
The acceptor unit of PTVT-T (1g)			
Reagent	Quantity	Unit	Cost(\$)
NBS	0.545g	2.752\$/25g	0.060
Pd(PPh <sub>3</sub> ) <sub>4</sub>	0.0577g	378.4\$/25g	0.873
AIBN	0.0044g	3.44\$/25g	0.000605
	0.585g	331.341\$/2.5g	77.534
	0.569g	181.632\$/25g	4.134
DCC	1.36g	2.064\$/25g	0.112
DMAP	0.322g	2.752\$/25g	0.0354
	0.908g	100.173\$/25g	3.638
Total Cost			86.387



**Figure S3.** The detailed synthetic route of each step of the acceptor unit of PTVT-BT.<sup>3</sup>


**Table S3.** The MOC evaluation of the acceptor unit of PTVT-BT.

The acceptor unit of PTVT-BT (1g)			
Reagent	Quantity	Unit	Cost(\$)
NBS	0.518g	2.752\$/25g	0.057
Pd(PPh <sub>3</sub> ) <sub>4</sub>	0.0593g	378.4\$/25g	0.898
AIBN	4.273mg	3.44\$/25g	0.000588
	0.5624g	331.341\$/2.5g	74.538
	0.547g	181.632\$/25g	3.974
DMF	1.1397ml	2.752\$/100ml	0.0314
DCC	1.4429g	2.064\$/25g	0.119
DMAP	0.3426g	2.752\$/25g	0.0377
	0.965g	100.173\$/25g	3.867
Total Cost			83.523



**Figure S4.** The detailed synthetic route of each step of the acceptor unit of PTQ10.<sup>4</sup>

**Table S4.** The MOC evaluation of the acceptor unit of PTQ10.

The acceptor unit of PTQ10 (1g)			
Reagent	Quantity	Unit	Cost(\$)
Glyoxylic acid	0.1440g	2.064\$/25g	0.012
AcOH	19.4800ml	38.115\$/500ml	1.485
1-bromo-2-hexyldecane	0.5825g	4.128\$/5g	0.481
t-BuOK	0.2565g	2.752\$/25g	0.028
CH <sub>3</sub> OH	19.4800ml	6.880\$/500ml	0.268
	0.5883g	217.408\$/5g	25.580
Total Cost			27.854

## References

- 1 X. Yuan, Y. Zhao, Y. Zhang, D. Xie, W. Deng, J. Li, H. Wu, C. Duan, F. Huang and Y. Cao, *Adv. Funct. Mater.*, 2022, **32**, 2201142.
- 2 J. Ren, P. Bi, J. Zhang, J. Liu, J. Wang, Y. Xu, Z. Wei, S. Zhang and J. Hou, *Natl. Sci. Rev.*, 2021, **8**, nwab031.
- 3 P. Bi, J. Ren, S. Zhang, J. Wang, Z. Chen, M. Gao, Y. Cui, T. Zhang, J. Qin, Z. Zheng, L. Ye, X. Hao and J. Hou, *Nano Energy*, 2022, **100**, 107463.
- 4 C. Sun, F. Pan, H. Bin, J. Zhang, L. Xue, B. Qiu, Z. Wei, Z.-G. Zhang and Y. Li, *Nat. Commun.*, 2018, **9**, 743.