

Electronic Supplementary Information:

Two Low-cost and Efficient Hole-transport Materials for n-i-p Type Organic-inorganic Hybrid Perovskite Solar Cells

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Contents

- 1. Evaluation basis of cost of HTMs**
- 2. *J*-*V* curves of devices under opposite scan direction.**
- 3. NMR and MS Data**

1. Evaluation basis of cost of HTMs

Table S1. Evaluation basis of cost of Bp-OMe.

Reagent	Amount (g)	Amount (mL)	Price (\$/g or \$/mL)	Total price (\$)
3,3',5,5'-Tetrabromobiphenyl	0.24		37.500	9.00
4-(4,4,5,5-tetramethyl-1,3,2-dioxaborolan-2-yl)-N,N-bis(4-methoxyphenyl)aniline	1.08		20.635	22.29
THF		20	0.007	0.14
Pd(PPh ₃) ₄	0.65		1.776	1.15
K ₂ CO ₃	0.54		0.020	0.01
methanol		200	0.016	3.2
CH ₂ Cl ₂		200	0.003	0.6
Total cost			36.39	
Amount Bp-OMe (g)			0.58	
COST for Bp-OMe (\$/g)			62.7	

Table S2. Evaluation basis of cost of Py-OMe.

Reagent	Amount (g)	Amount (mL)	Price (\$/g or \$/mL)	Total price (\$)
1,3,6,8-Tetrabromopyrene	0.26		16.068	4.18
4-(4,4,5,5-tetramethyl-1,3,2-dioxaborolan-2-yl)-N,N-bis(4-methoxyphenyl)aniline	1.08		20.635	22.29
THF		20	0.007	0.14
Pd(PPh ₃) ₄	0.65		1.776	1.15
K ₂ CO ₃	0.54		0.020	0.01
methanol		200	0.016	3.2
CH ₂ Cl ₂		200	0.003	0.6
Total cost			31.57	
Amount Py-OMe (g)			0.63	
COST for Py-OMe (\$/g)			50.1	

2.

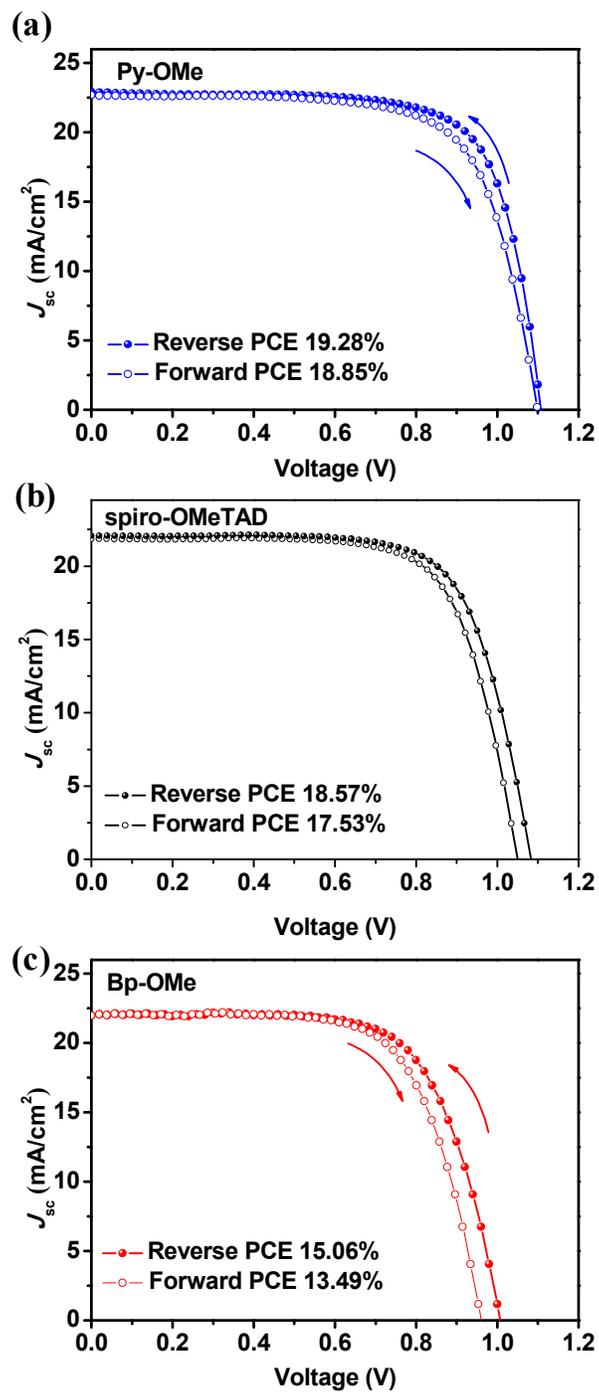


Figure S1. J - V curves of devices based on (a) Py-OMe, (b) spiro-OMe and (c) Bp-OMe under opposite scan direction.

3. Figure S2. ^1H NMR spectrum of **Bp-OMe** in DMSO-d^6 :

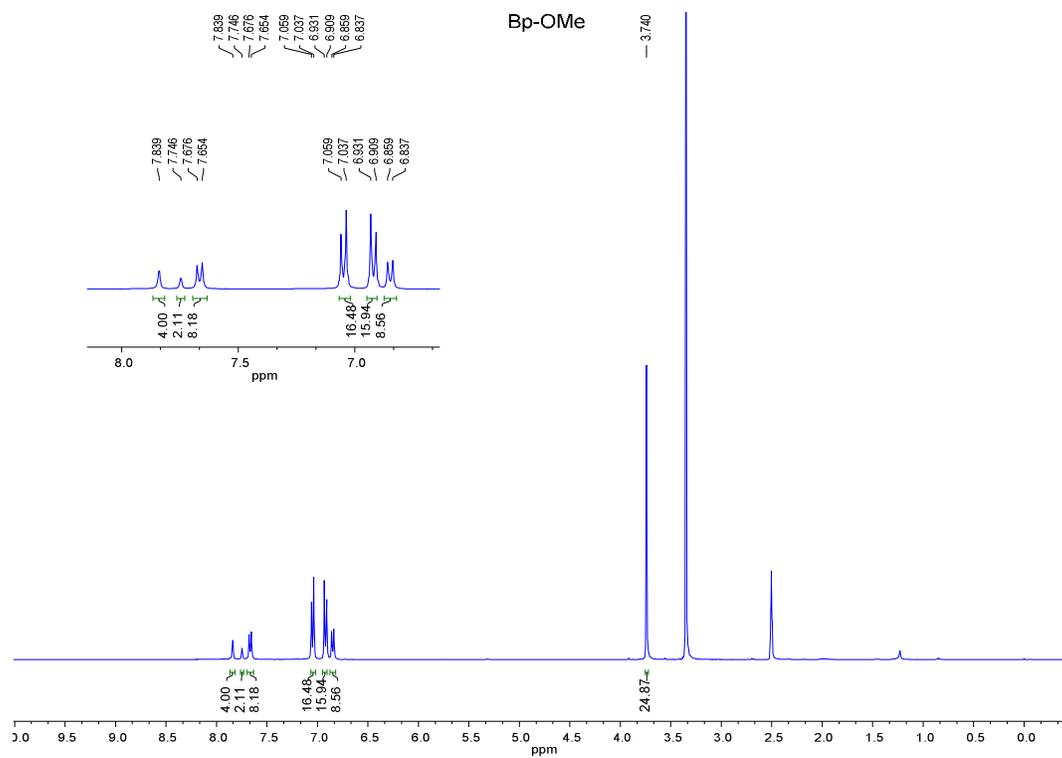


Figure S3. ^{13}C NMR spectrum of **Bp-OMe** in DMSO-d^6 :

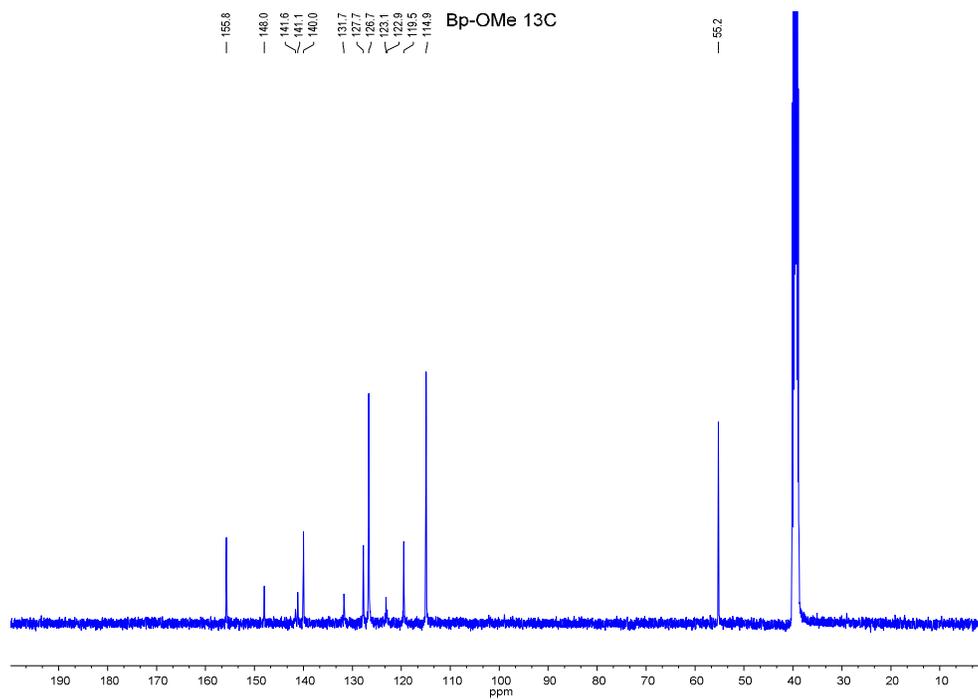


Figure S4. HR-MALDI mass spectra of **Bp-OMe**:

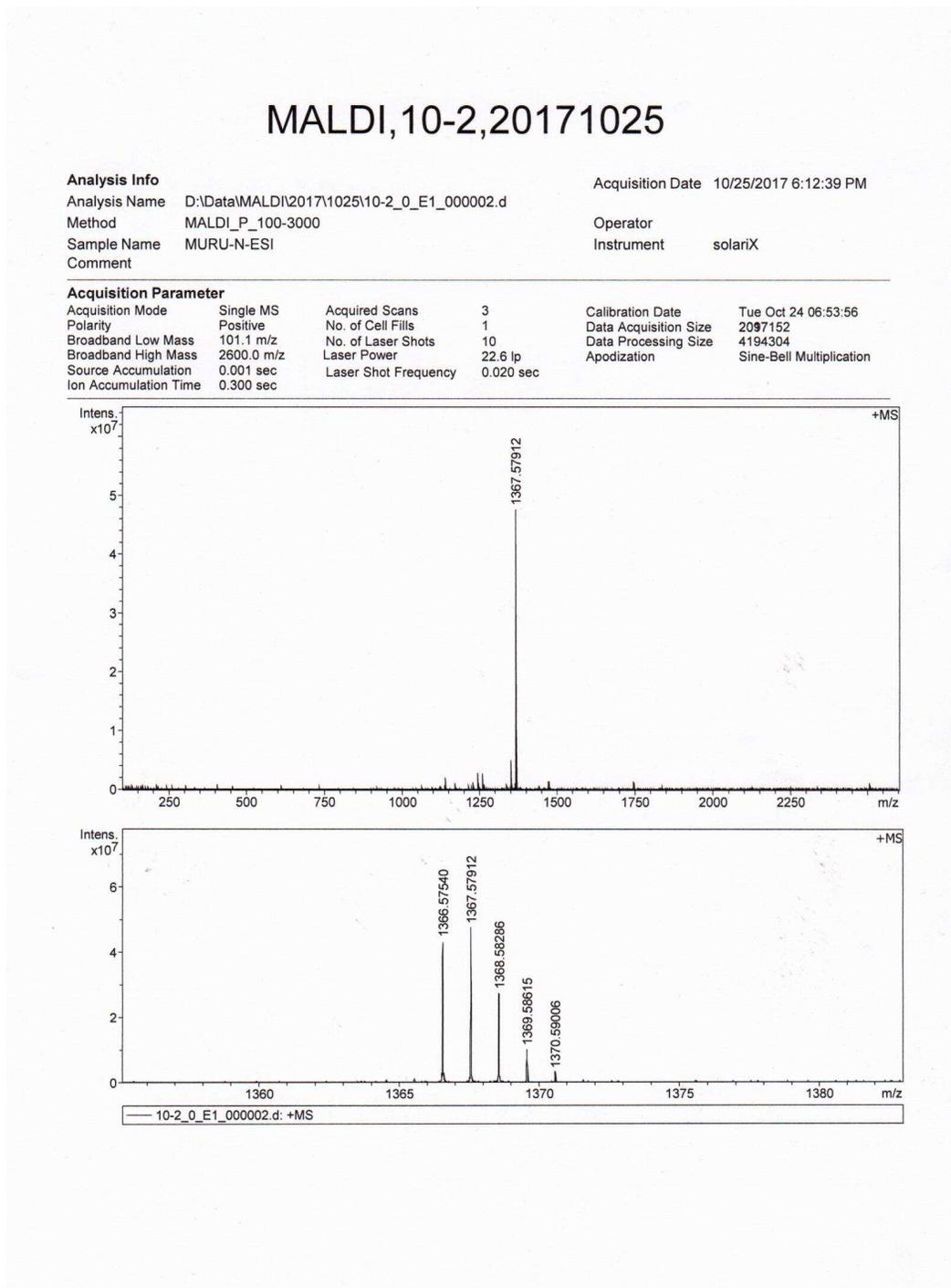


Figure S5. ^1H NMR spectrum of **Py-OMe** in DMSO-d^6 :

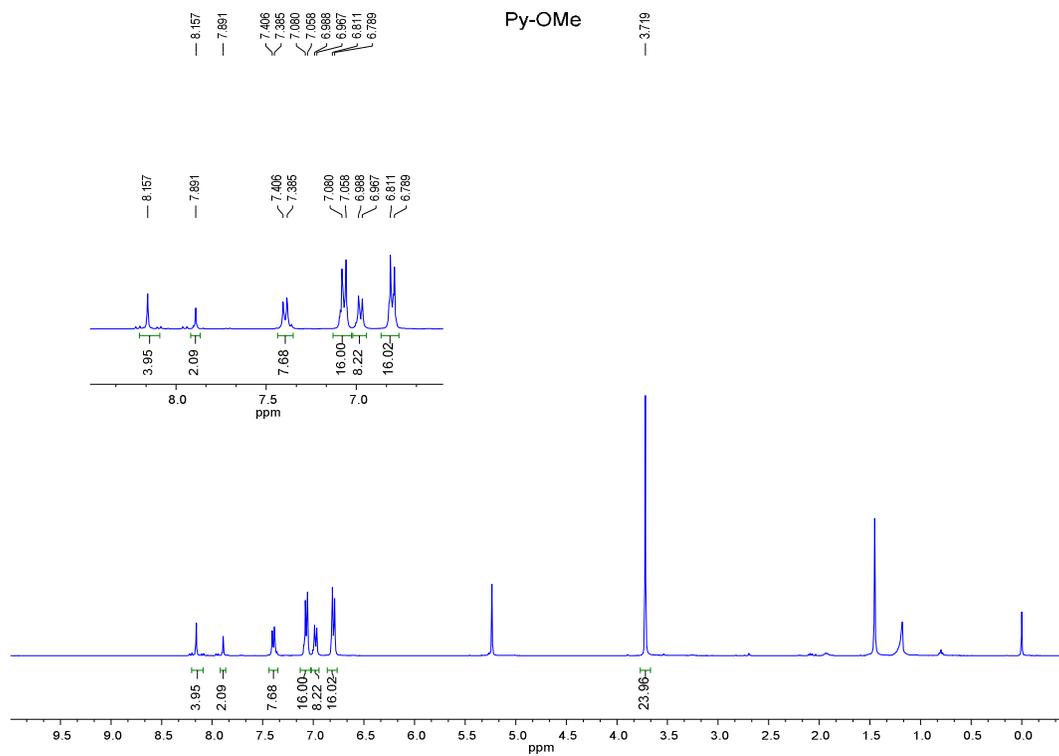


Figure S6. ^{13}C NMR spectrum of **Py-OMe** in DMSO-d^6 :

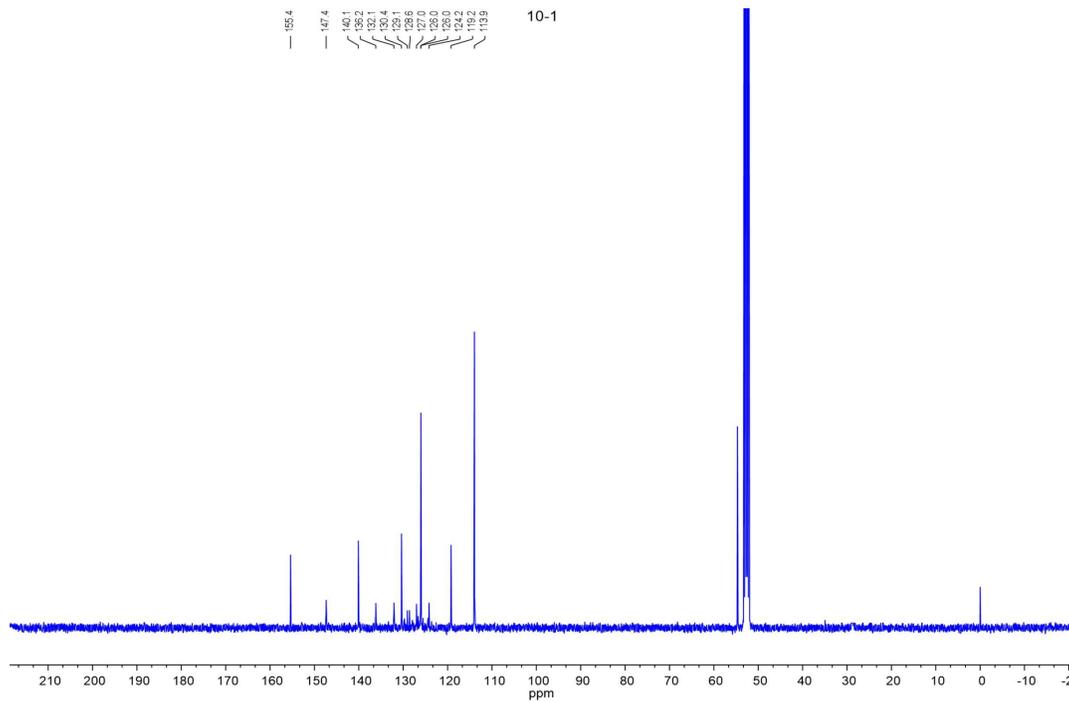


Figure S7. HR-MALDI mass spectra of **Py-OMe**:

