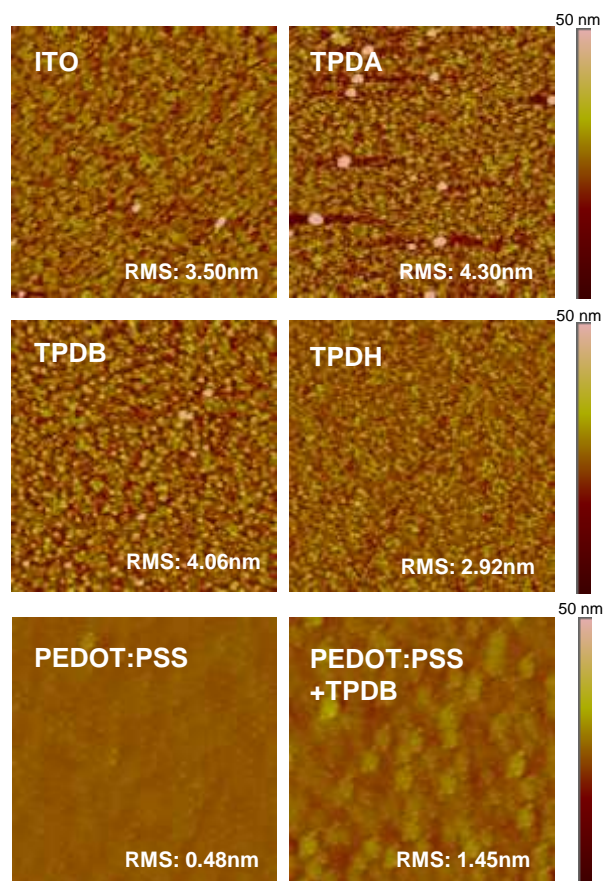


## Electronic Supplementary Information

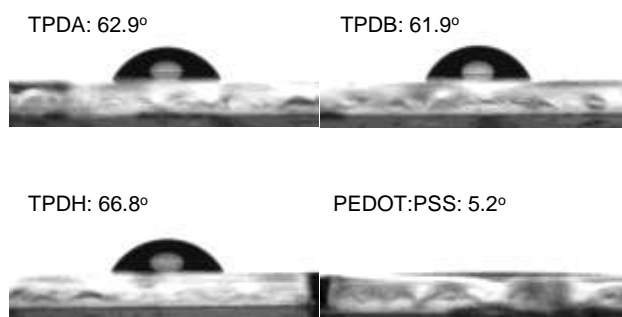
**Newsolution-processable small molecules used as hole-transporting layer in efficient polymer solar cells**

Kunyuan Lu, Jianyu Yuan, Jun Peng, Xiaodong Huang, Linsong Cui, Zuoquan Jiang, Hai-Qiao Wang\* and Wanli Ma\*

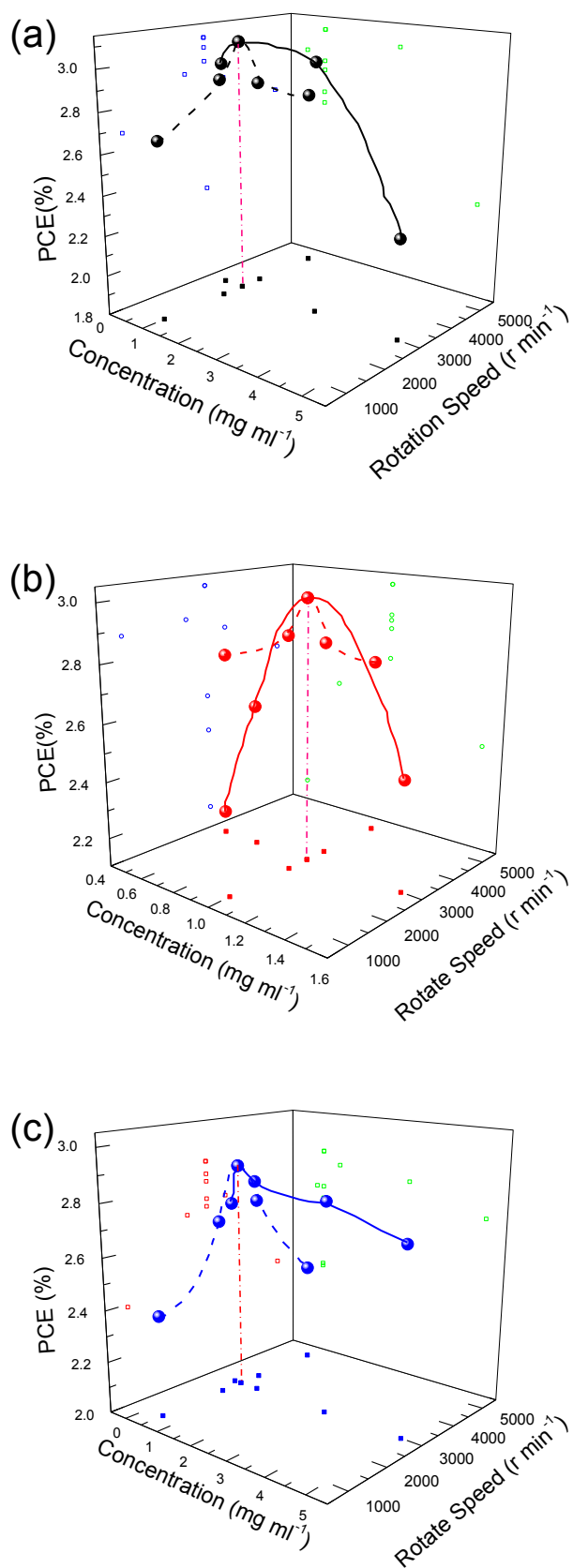
*Jiangsu Key Laboratory for Carbon-Based Functional Materials & Devices, Institute of Functional Nano & Soft Materials (FUNSOM), Soochow University, Suzhou, Jiangsu 215123, China. E-mail: hqwang@suda.edu.cn; wlma@suda.edu.cn*



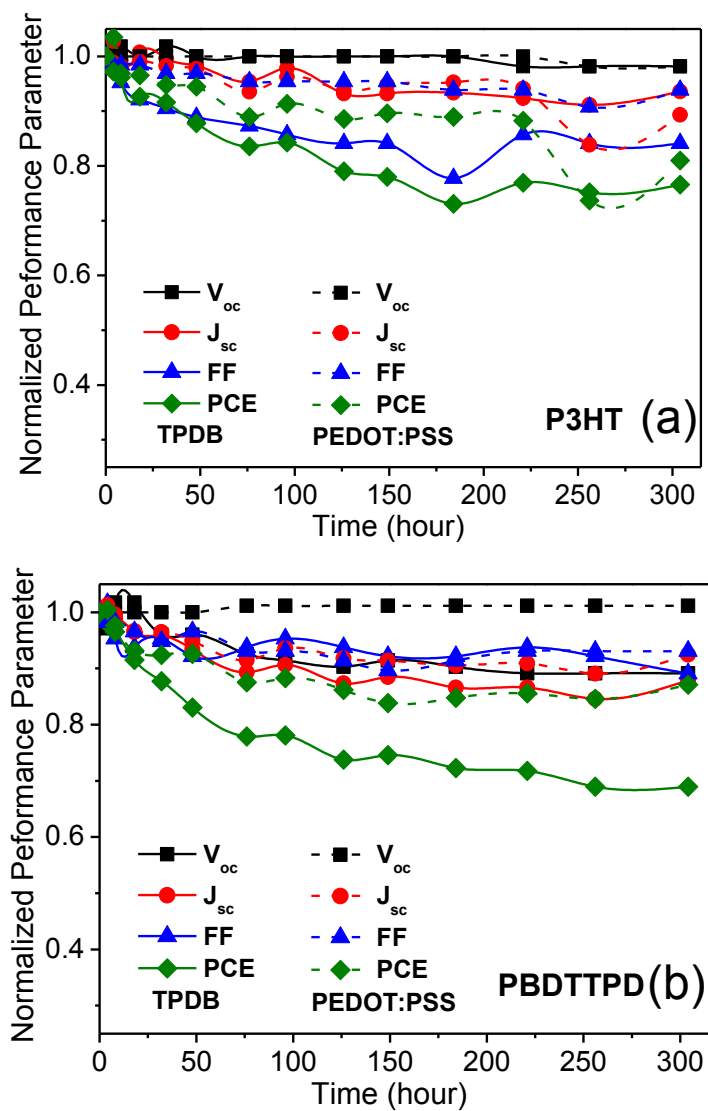
**Fig. S1** AFM images ( $5\mu\text{m} \times 5\mu\text{m}$ ).



**Fig. S2** Contact angles of different HTMs.



**Fig. S3** Effects of different conditions on the performance of devices based on P3HT:PC<sub>61</sub>BM with (a)TPDA (IPA), (b)TPDB (IPA), (c)TPDH (DMF).



**Fig. S4** The stability of device (P3HT:PC<sub>61</sub>BM) characteristics (a) and device (PBDTTPD:PC<sub>61</sub>BM) characteristics (b) in N<sub>2</sub>-filled glove box without encapsulation.

**Table S1** Photovoltaic performances of P3HT:PC<sub>61</sub>BM based devices with TPDB in different solvents.

Solvent	V <sub>oc</sub> (V)	J <sub>sc</sub> (mAcm <sup>-2</sup> )	FF (%)	PCE (%)
A <sup>a</sup>	0.55	8.52	0.62	2.91
B <sup>a</sup>	0.55	8.80	0.59	2.86
C <sup>a</sup>	0.55	8.52	0.61	2.86
D <sup>a</sup>	0.55	8.58	0.60	2.83

<sup>a</sup>A: Acetone, B: Acetonitrile, C: Methanol, D: Methoxyethanol.

**Table S2** The pH value measurement of TPDA, TPDB and TPDH solutions.

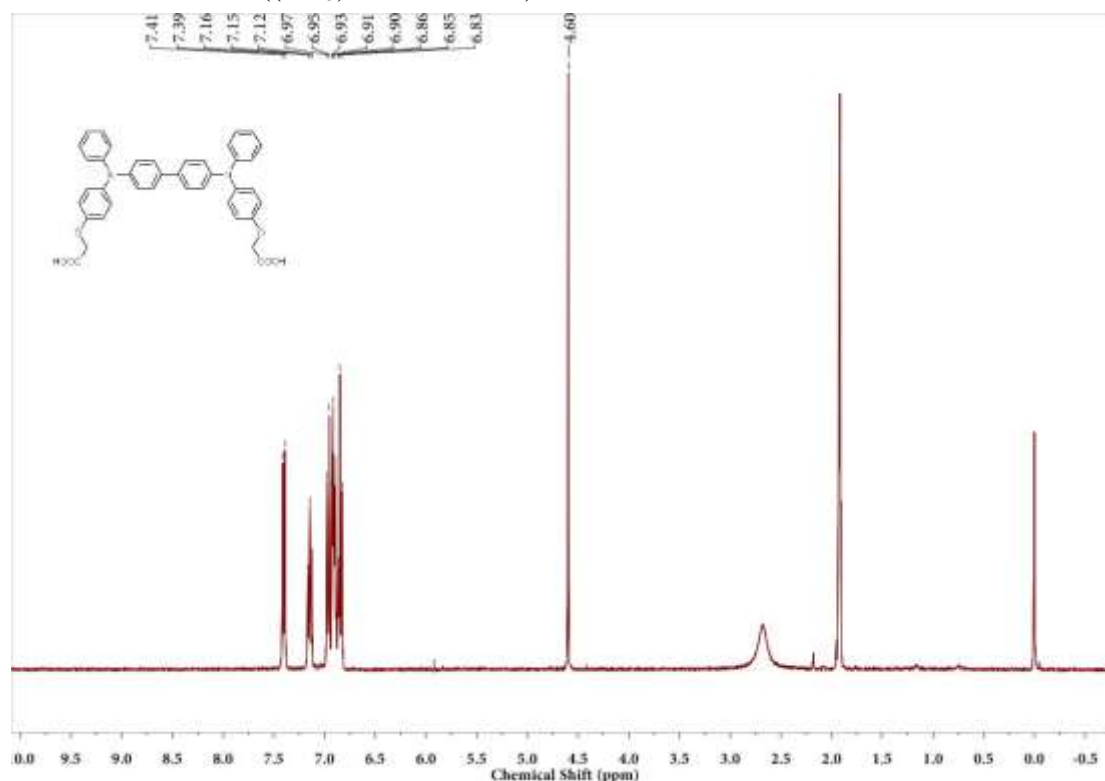
HTM	Solvent	Concentration (mg ml <sup>-1</sup> )	pH
TPDA	Isopropanol	1	7.10
TPDB	Isopropanol	1	7.30
TPDH	Acetone	0.5	8.66

#### Detailed experiments of the TPD-type HTM solution:

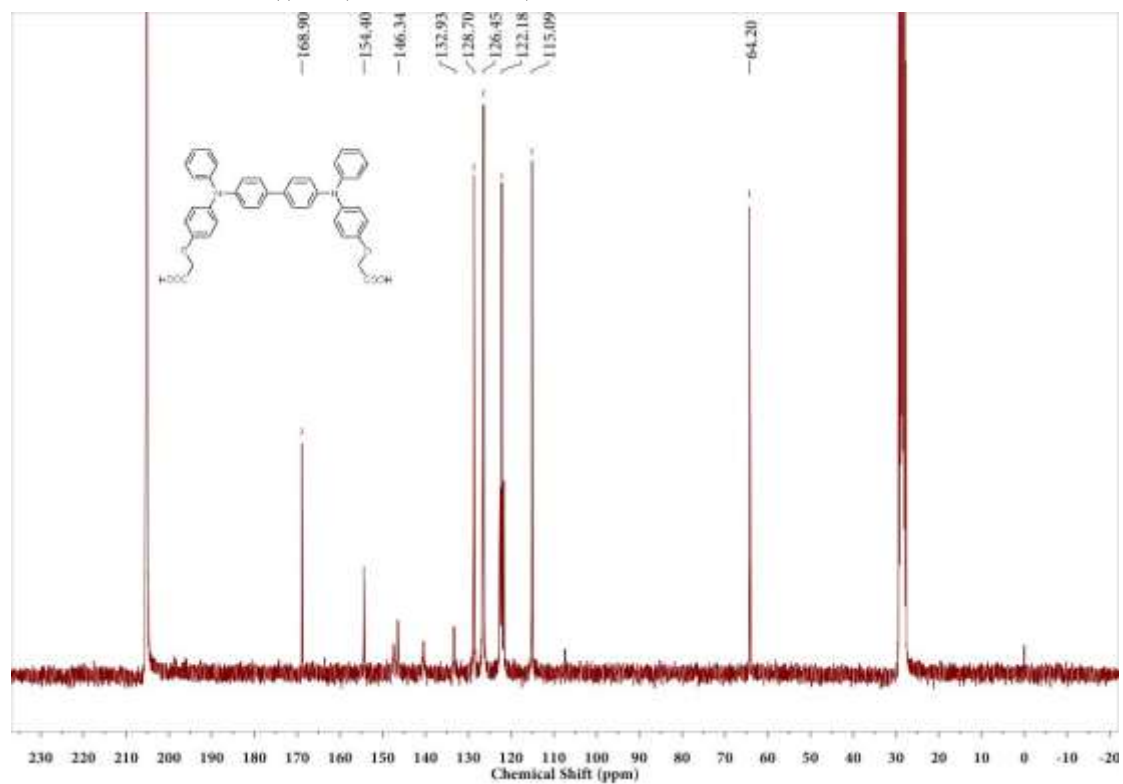
The pH values were recorded from the pH meters (Sartorius PB-10) for TPDA isopropanol solution (1 mg/mL<sup>-1</sup>), TPDB isopropanol solution (1 mg/mL<sup>-1</sup>), and TPDH acetone solution (0.5 mg/mL<sup>-1</sup>).

#### <sup>1</sup>H and <sup>13</sup>C NMR spectra

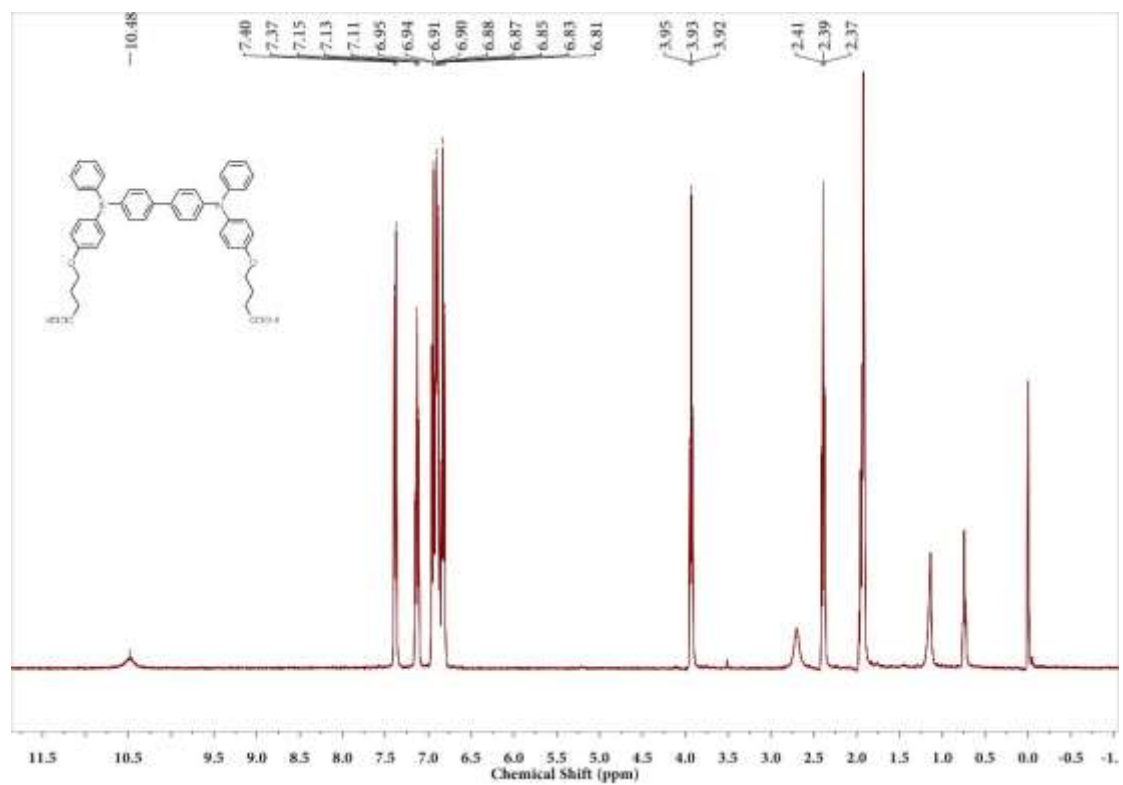
<sup>1</sup>H-NMR of TPDA ((CD<sub>3</sub>)<sub>2</sub>CO 400MHz)



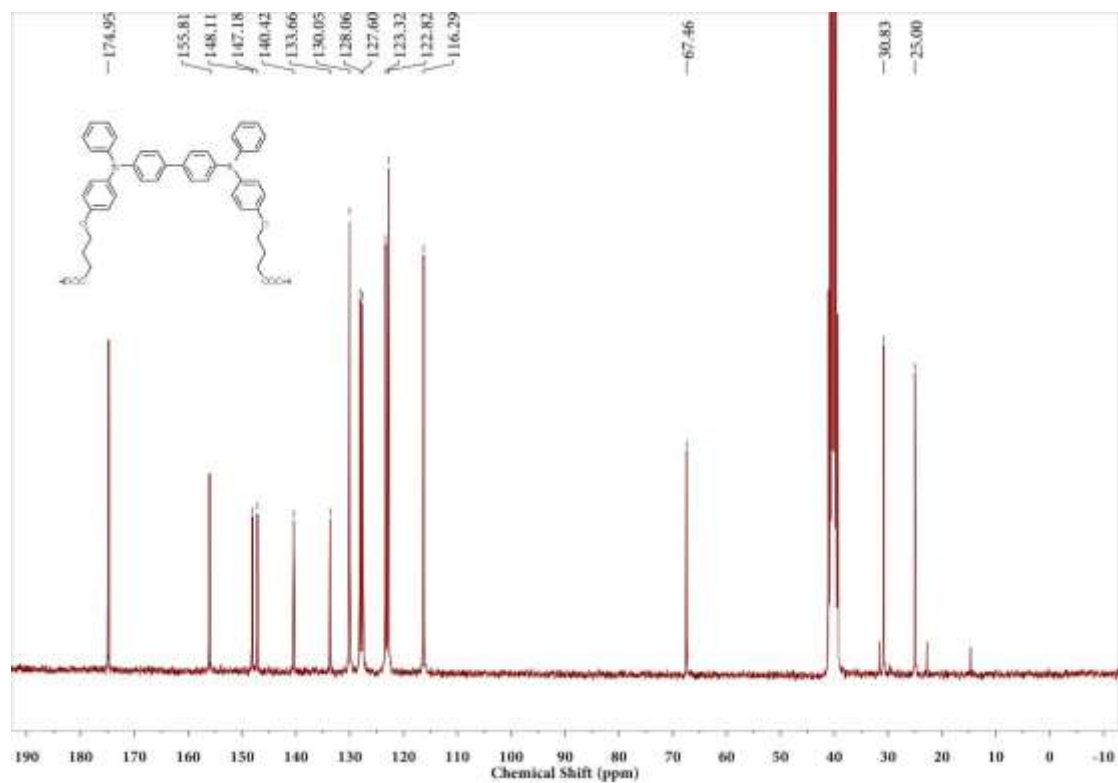
$^{13}\text{C}$ -NMR of TPDA ( $(\text{CD}_3)_2\text{CO}$  300MHz)



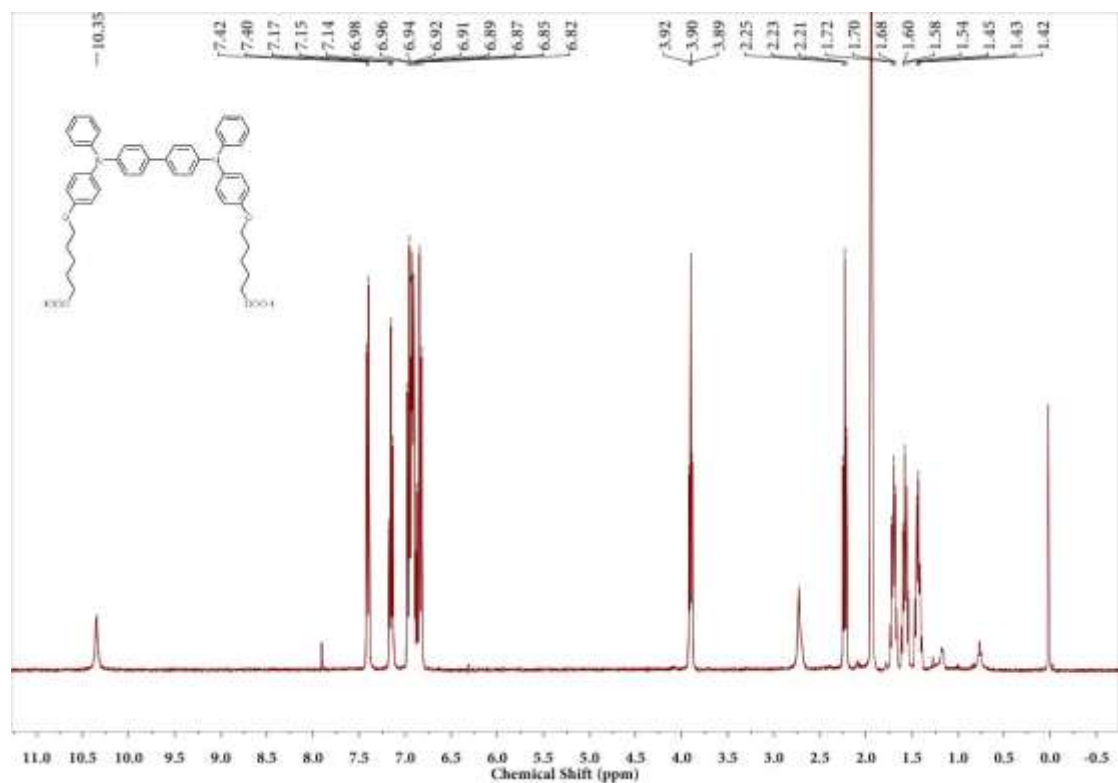
$^1\text{H}$ -NMR of TPDB ( $(\text{CD}_3)_2\text{CO}$  400MHz)



$^{13}\text{C}$ -NMR of TPDB ( $(\text{CD}_3)_2\text{SO}$  300MHz)



$^1\text{H}$ -NMR of TPDH ( $(\text{CD}_3)_2\text{CO}$  400MHz)



$^{13}\text{C}$ -NMR of TPDH ( $(\text{CD}_3)_2\text{SO}$  400MHz)

