Electronic Supplementary Material (ESI) for Physical Chemistry Chemical Physics.


# Supporting Information

**Hole-transporting interlayers based on pyrazine-containing conjugated polymers for perovskite solar cells.**

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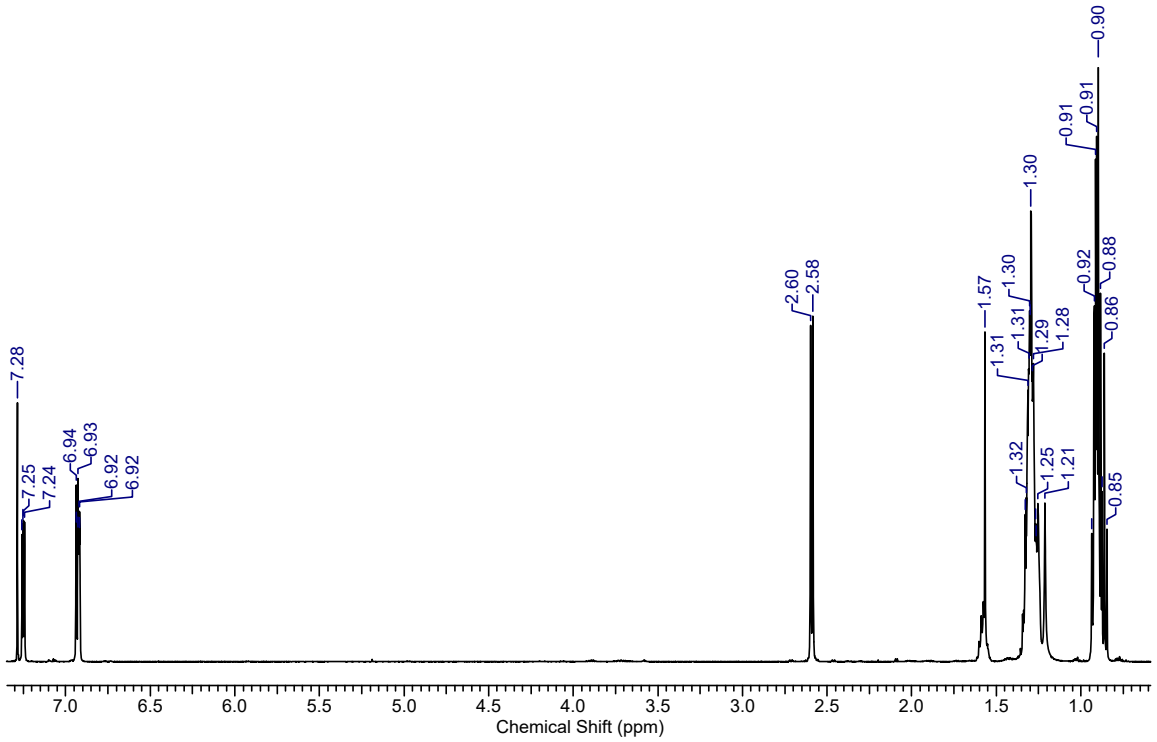


**Figure S1**. $^{1}$H NMR spectrum of compound **2**.

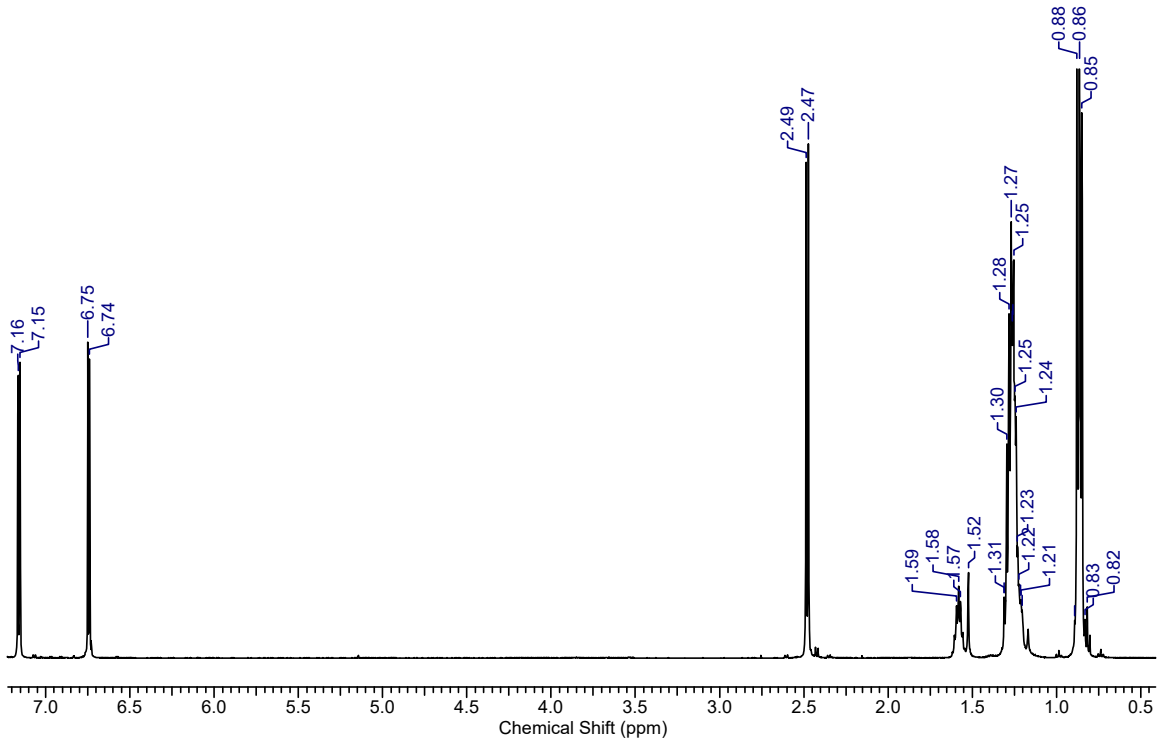


**Figure S2**. $^{1}$H NMR spectrum of compound **3**.

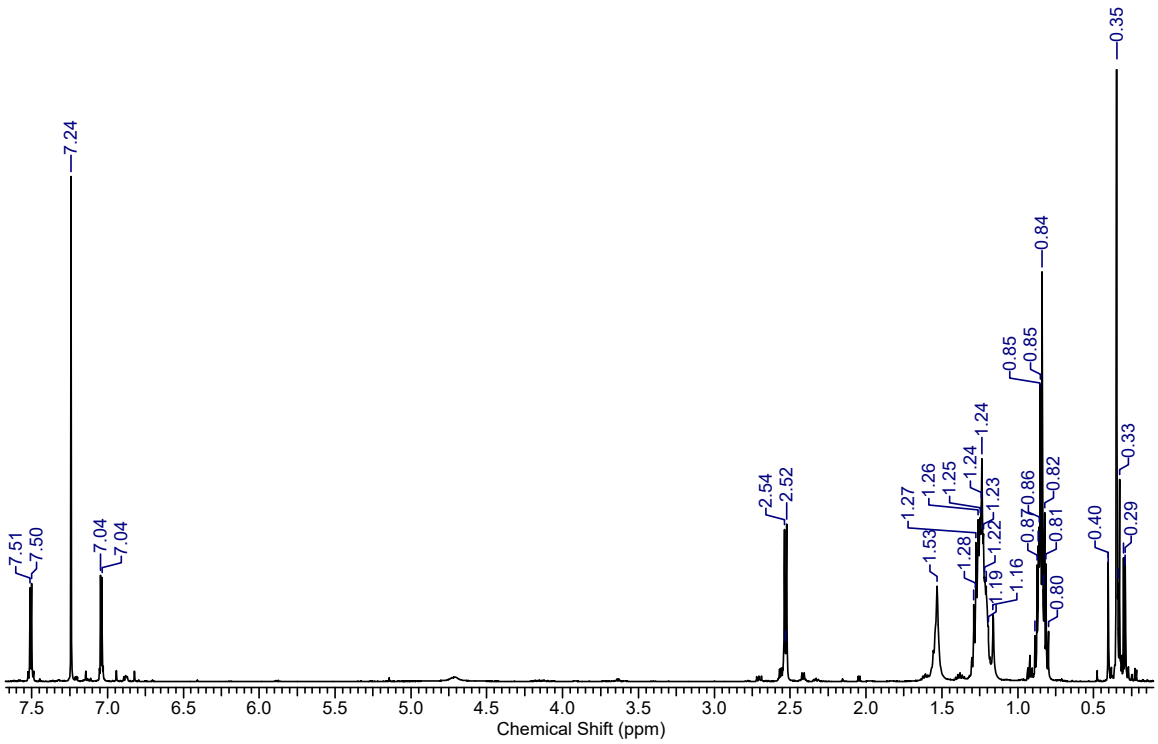


**Figure S3**. $^{1}$H NMR spectrum of compound **4**.

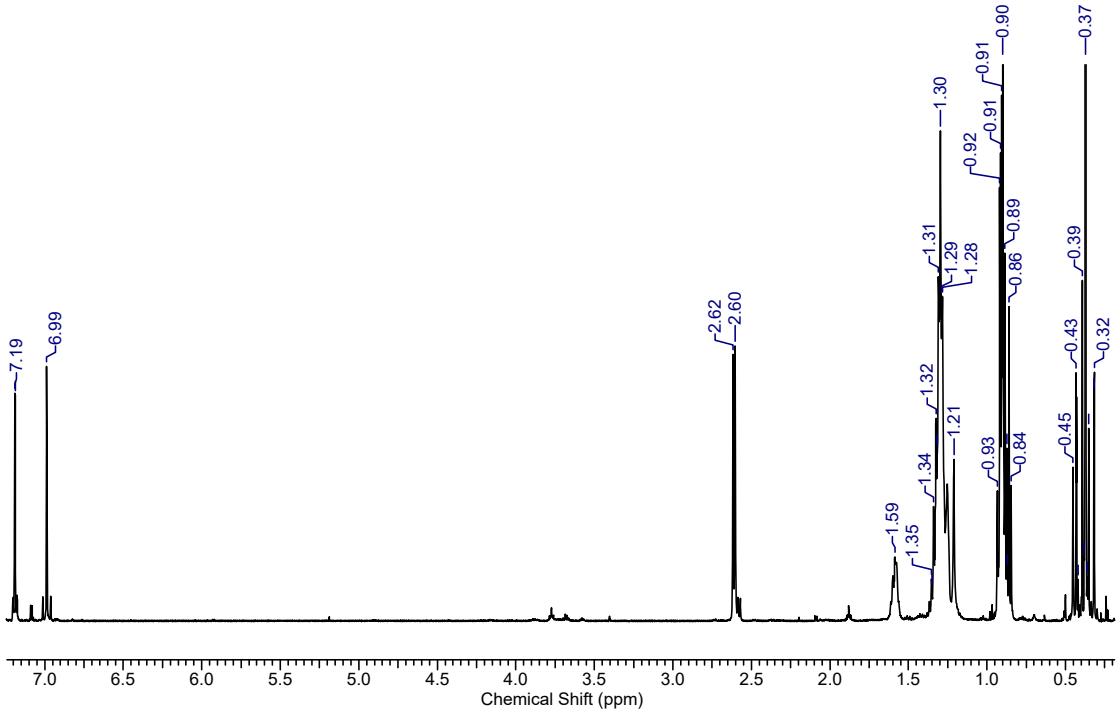


**Figure S4**. $^{1}$H NMR spectrum of compound **5**.

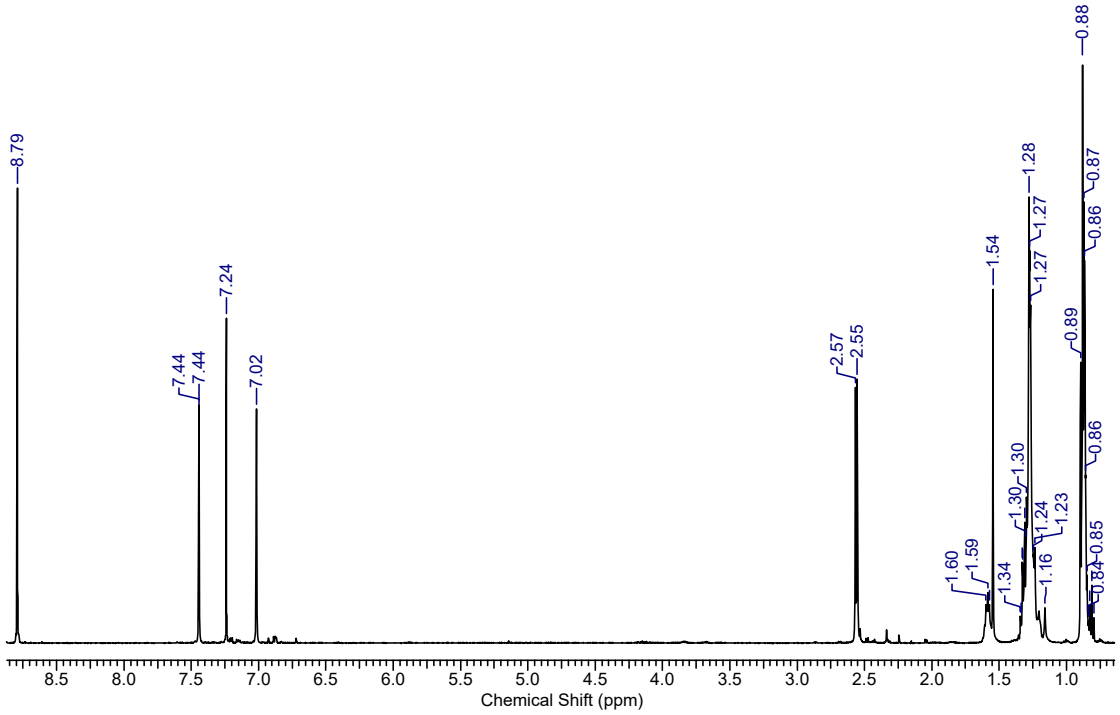


**Figure S5**. $^{1}$H NMR spectrum of compound **6**.

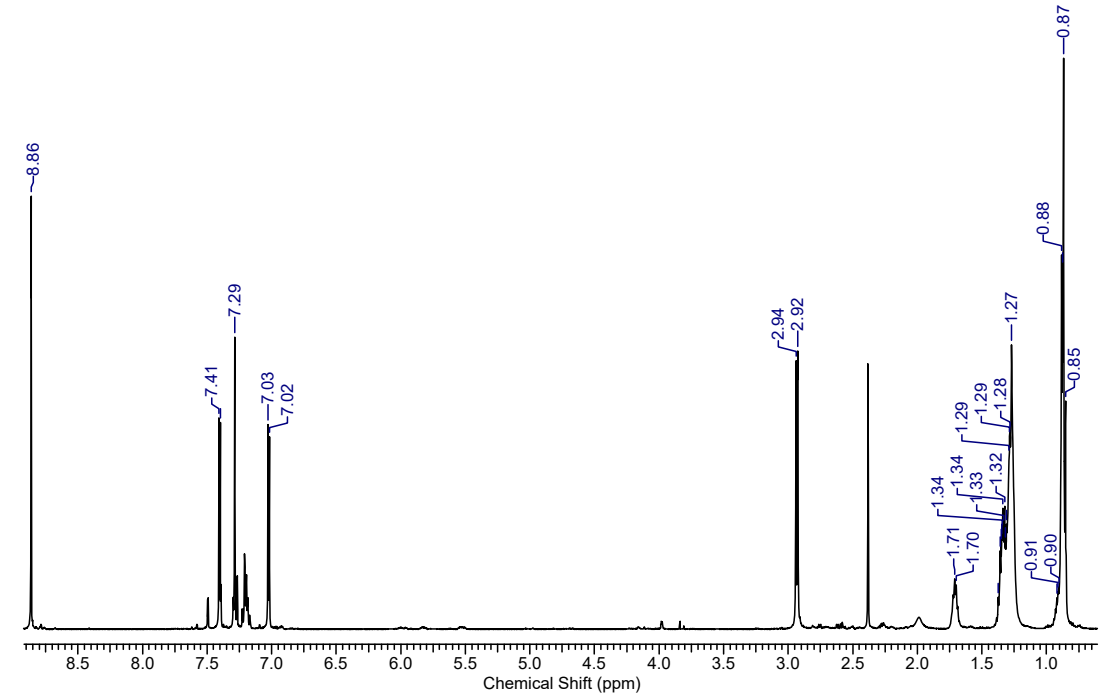


**Figure S6**. $^{1}$H NMR spectrum of compound **7**.

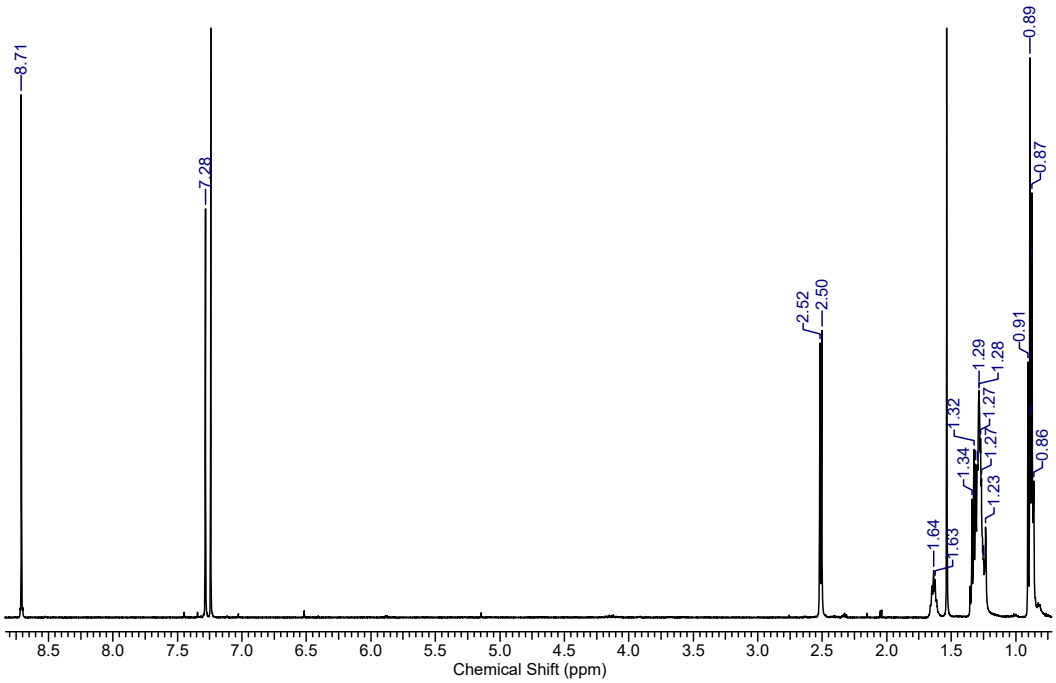


**Figure S7**. $^{1}$H NMR spectrum of monomer **DThPyT-ex**.

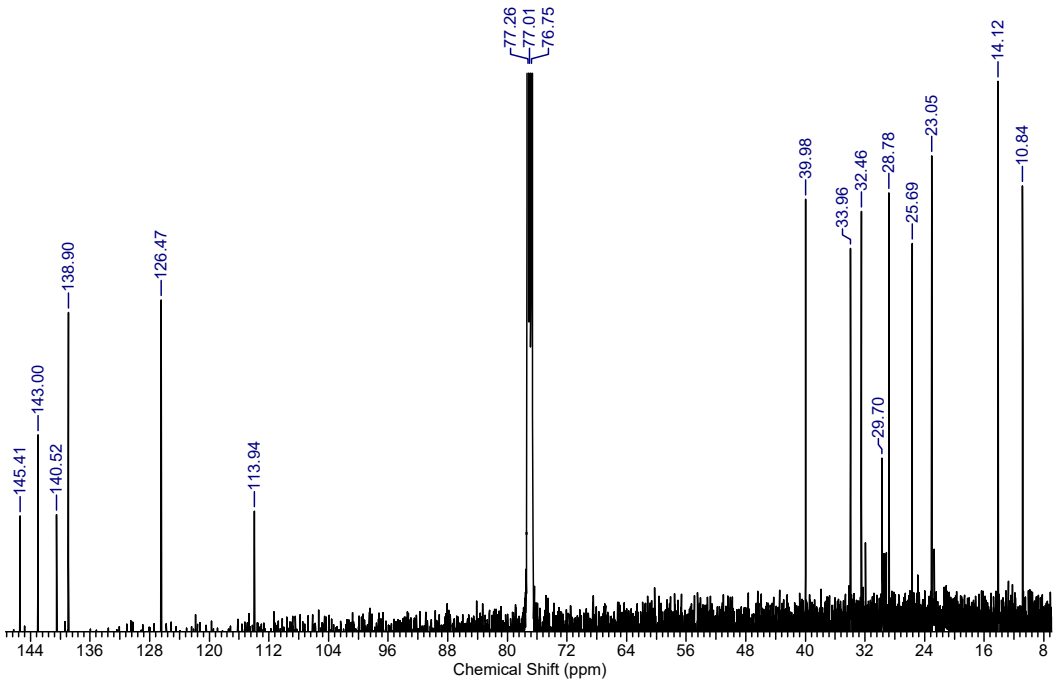


**Figure S8**. $^{13}$C NMR spectrum of monomer **DThPyT-ex**.

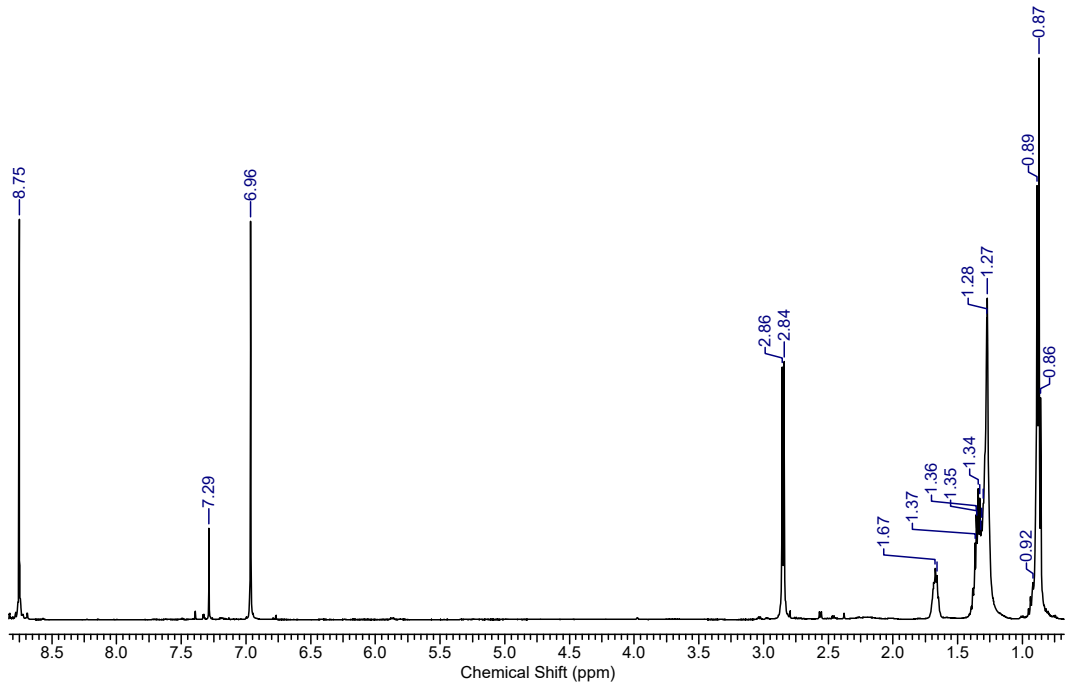


**Figure S9**. $^{1}$H NMR spectrum of monomer **DThPyT-in**.

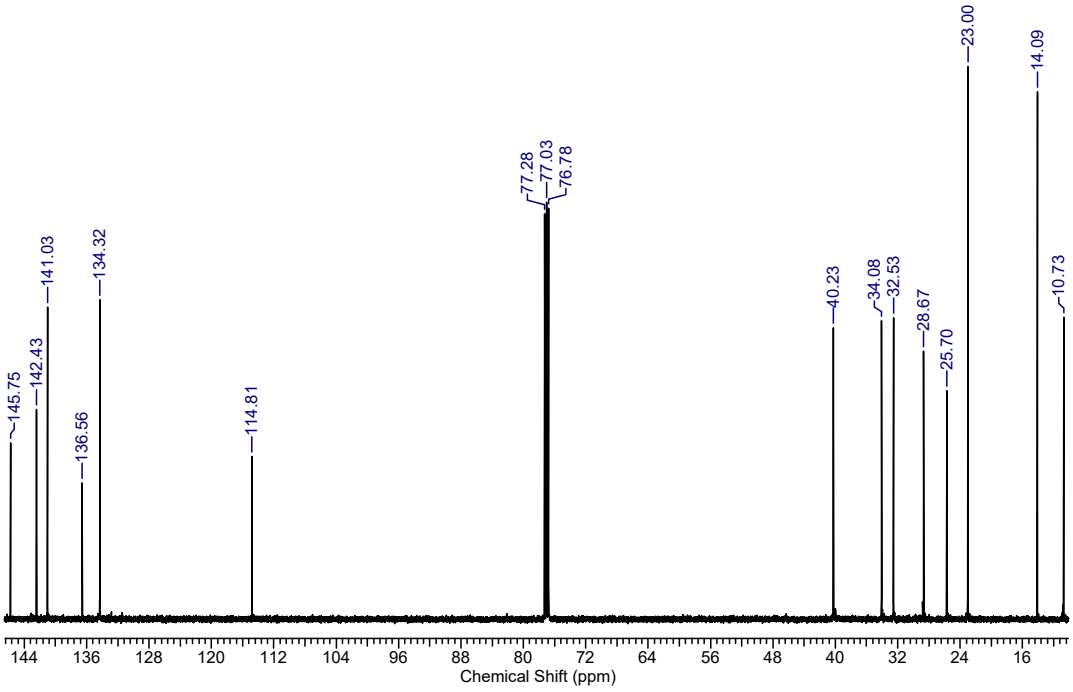


**Figure S10**. $^{13}$C NMR spectrum of monomer **DThPyT-in**.

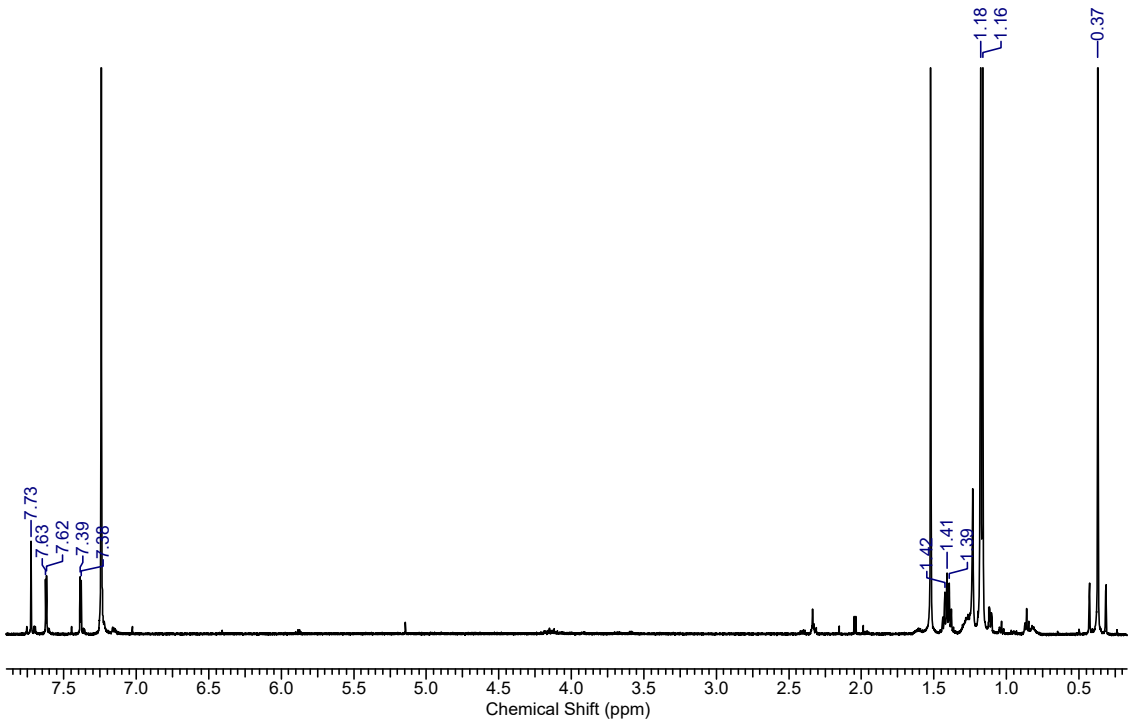


**Figure S11**. $^{1}$H NMR spectrum of monomer **BDT**.

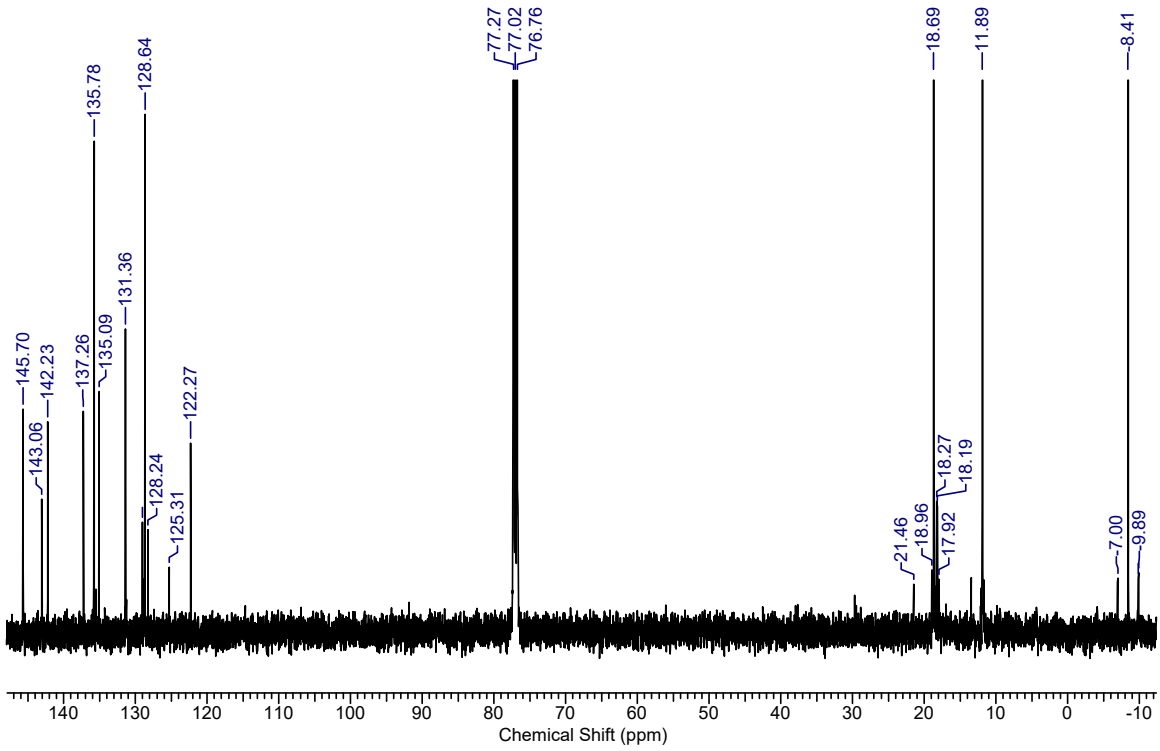


**Figure S12**. $^{13}$C NMR spectrum of monomer **BDT**.

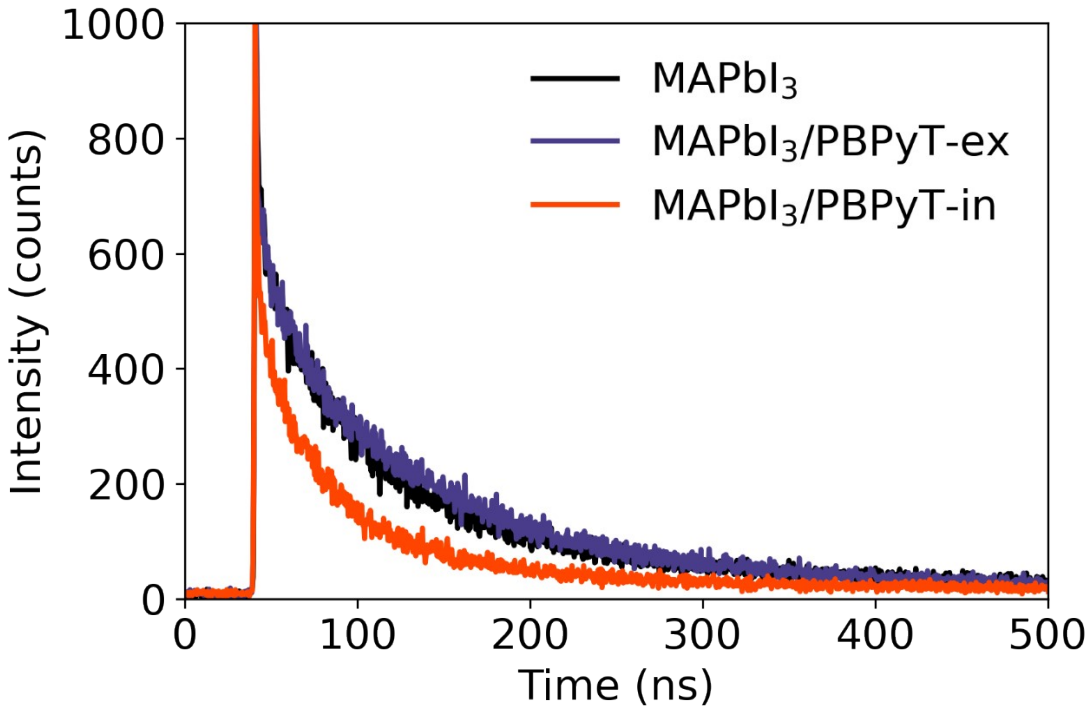


**Figure S13.** TRPL spectra of $MAPbI_3$, $MAPbI_3$/**PBPyT-ex** and $MAPbI_3$/**PBPyT-in**

**Table S1**. TRPL parameters extracted from decay curves.

| | $A_1$ | $\tau_1$ | $A_2$ | $\tau_2$ | c | $\tau_{avg}$ |
|---|---|---|---|---|---|---|
| PBPyT-ex | 36.7 | 5.3 | 366.5 | 105.1 | 14.3 | 104.6 |
| PBPyT-in | 15.6 | 1.8 | 282.5 | 56.2 | 14.5 | 56.1 |
| $MAPbI_3$ | 212.4 | 7.0 | 332.9 | 96.7 | 16.0 | 92.7 |

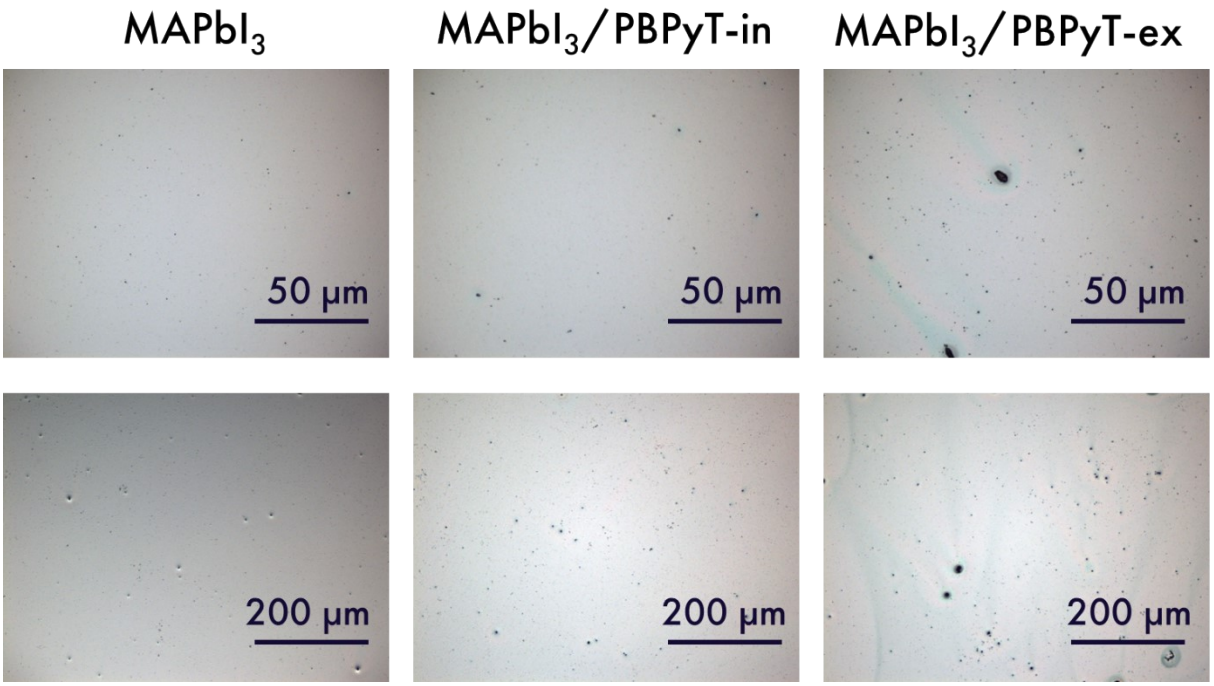


**Figure S14.** Optical microscopy images of glass substrates covered with $MAPbI_3$, $MAPbI_3$/**PBPyT-in**, and $MAPbI_3$/**PBPyT-ex**.