

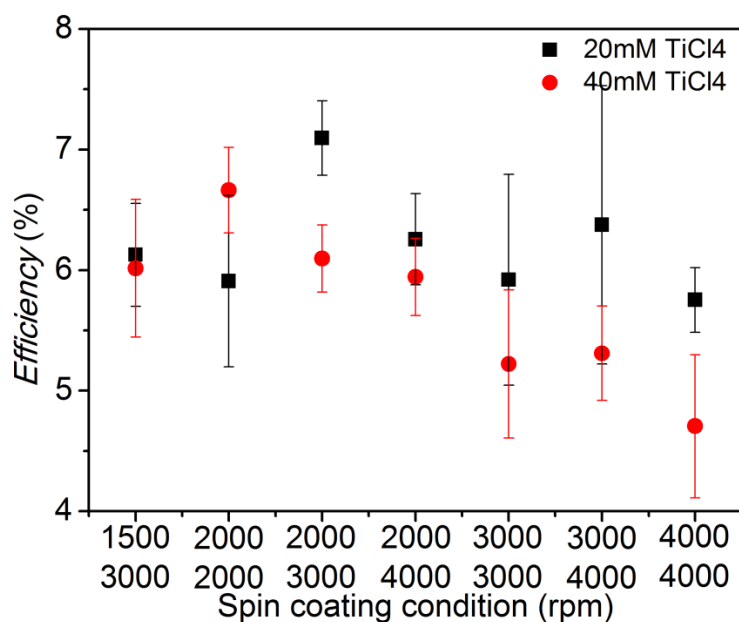
## Supporting Information

### Diketopyrrolopyrrole-Containing Hole Transporting Conjugated Polymer for use in Efficient Stable Organic-Inorganic Hybrid Solar Cells based on a Perovskite

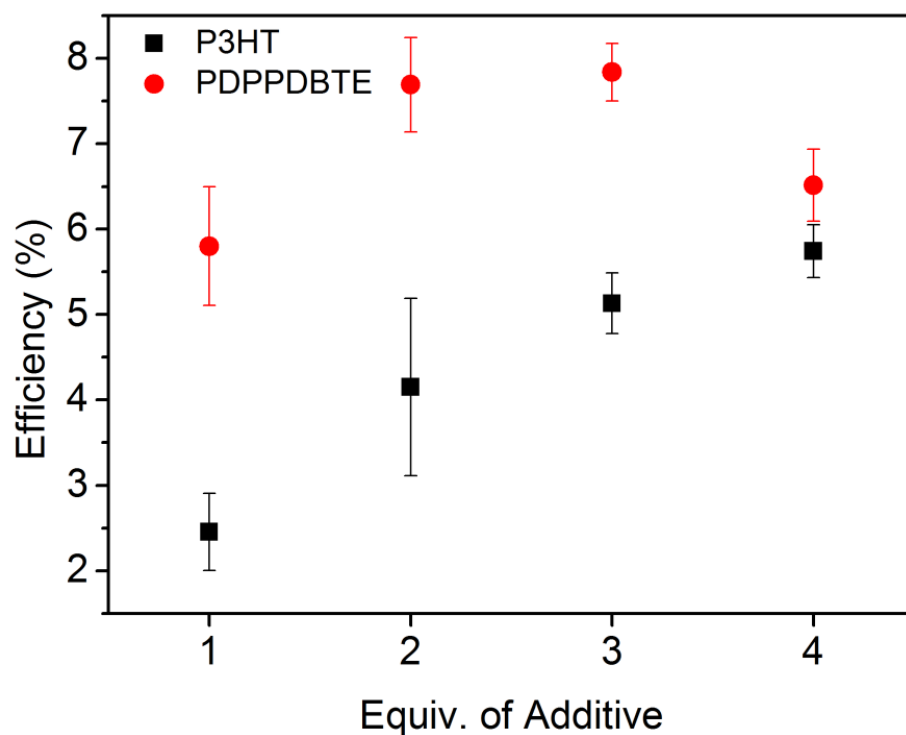
Young Soo Kwon,<sup>‡,a</sup> Jongchul Lim,<sup>‡,a</sup> Hui-Jun Yun,<sup>b</sup> Yun-Hi Kim,<sup>b,\*</sup> and Taiho Park<sup>a,\*</sup>

<sup>a</sup>Department of Chemical Engineering, Pohang University of Science and Technology, Pohang, Gyungbuk, Korea.

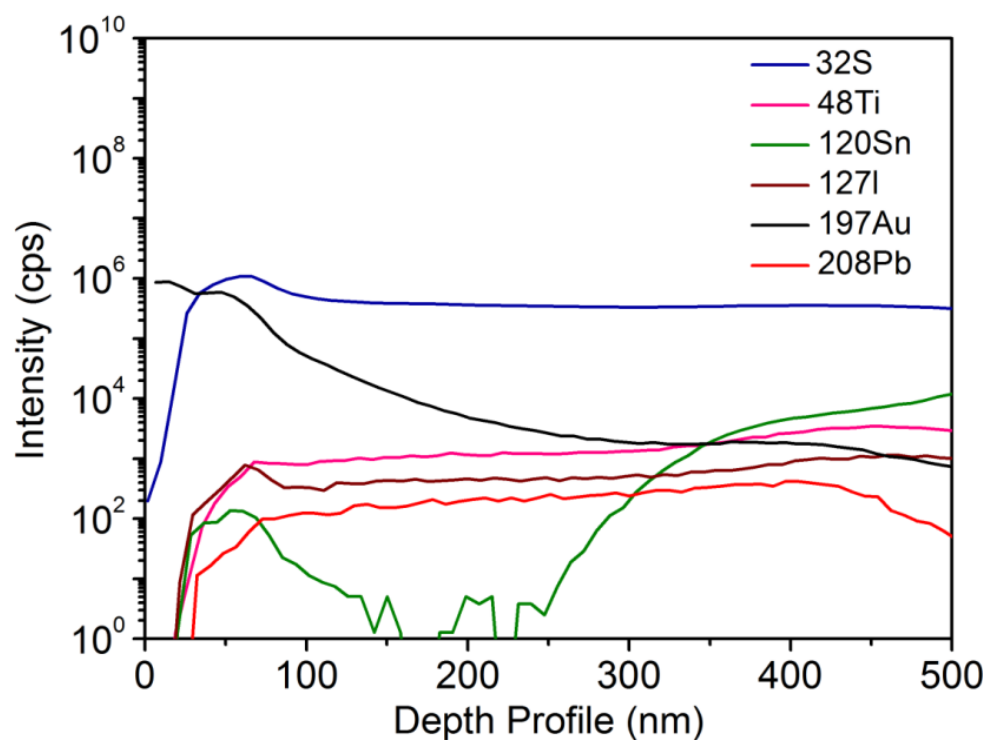
<sup>b</sup>Department of Chemistry, Gyungsang National University and Research Institute of Nature Science, Jinju, Gyungnam, Korea.



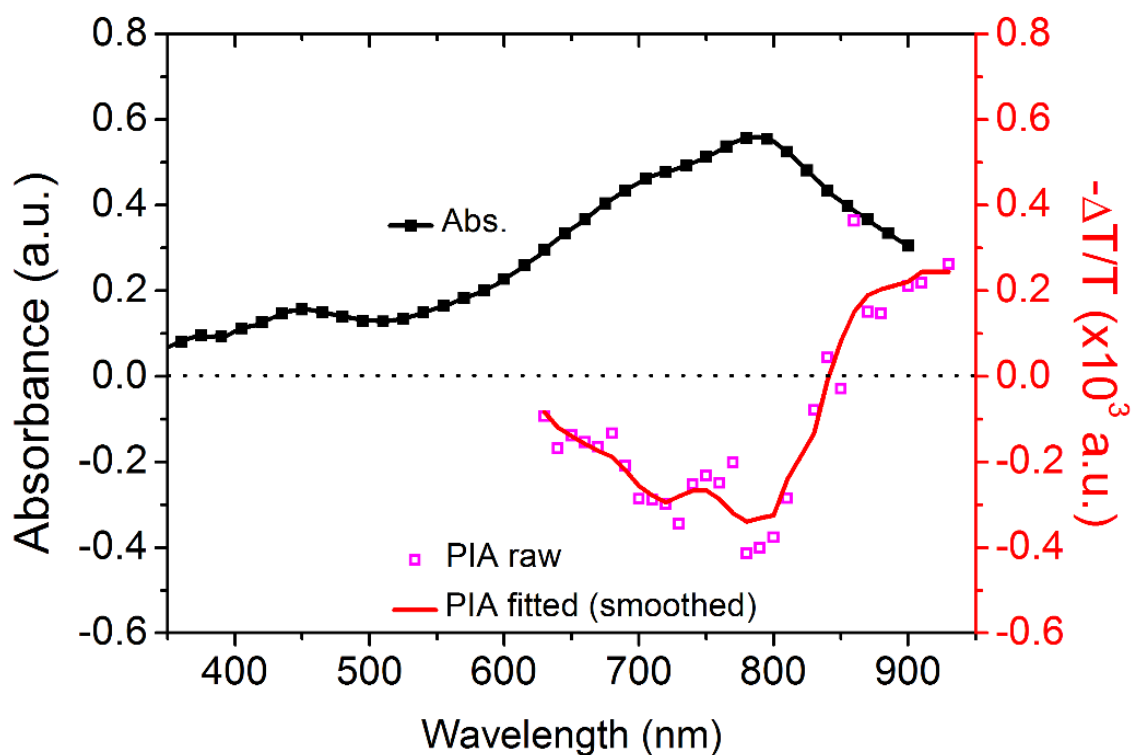
**Figure S1.** Optimization of  $\text{TiCl}_4$  treatment and spin coating process of  $\text{CH}_3\text{NH}_3\text{PbI}_3$  perovskite and the resulting tendency of photovoltaic performances using spiro-MeOTAD.



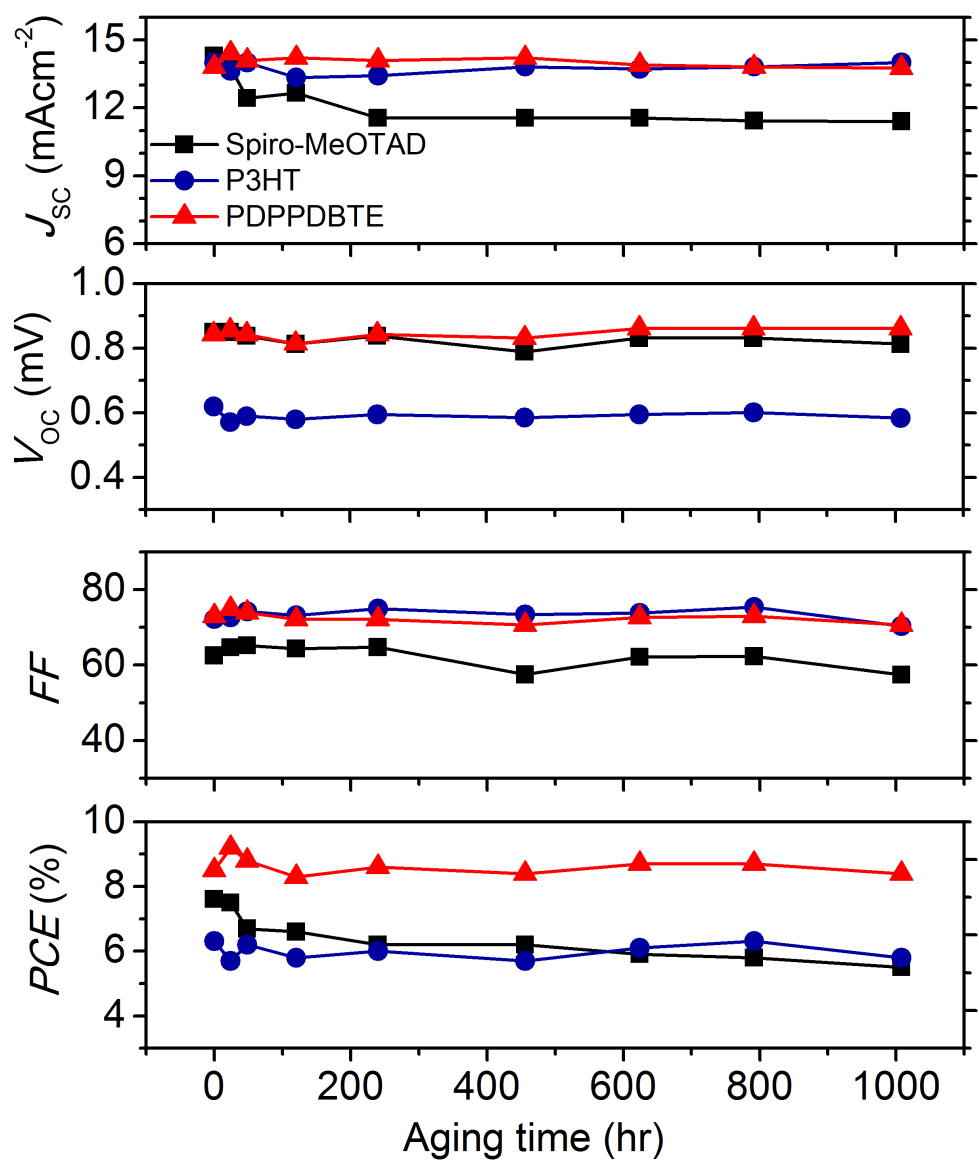
**Figure S2.** Optimization of concentration of additive mixed with P3HT and PDPPDBTE solution and the resulting tendency of photovoltaic performances. 1 equivalent of additives = 3.4  $\mu$ l tBP, 6.8  $\mu$ l Li-TFSI (from 28.3 mg/ml in acetonitrile)



**Figure S3.** SIMS (Secondary ion mass spectroscopy) depth profile of each element.  $\text{Cs}^+$  gun, impact energy: 15 keV, current: 70 pA, raster size:  $200\text{ }\mu\text{m} \times 200\text{ }\mu\text{m}$ , analysis area :  $33\text{ }\mu\text{m}$ , detected ion:  $^{32}\text{S}$ ,  $^{48}\text{Ti}$ ,  $^{120}\text{Sn}$ ,  $^{127}\text{I}$ ,  $^{197}\text{Au}$ ,  $^{208}\text{Pb}$



**Figure S4.** PIA spectra for PDPPDBTE with additives: absorbance (black square) and  $-\Delta T/T$  (red square) with fitted spectra (red line). The measurements were performed on the same samples used for the transient conductivity experiments.



**Figure S5.** Evolution of photovoltaic parameters for 3 HTM-based hybrid solar cells with aging time over 1000 hrs stored under ca. 20% humid atmosphere.