Electronic Supplementary Information

Acridine-based Novel Hole Transporting Material for High Efficiency Perovskite Solar Cell

An-Na Cho,[a] Nallan Chakravarthi,[b] Kakaraparthi Kranthiraja,[b] Saripally Sudhaker Reddy,[b] Hui-Seon Kim,[c] Sung-Ho Jin,[b]* and Nam-Gyu Park[a]*

[a]School of Chemical Engineering and Department of Energy Science, Sungkyunkwan University, Suwon 440-746, Korea.
[b]Department of Chemistry Education, Graduate Department of Chemical Materials, and Institute for Plastic Information and Energy Materials, Pusan National University, Busan 609-735, Korea
[c]Laboratory of Photomolecular Science, Institute of Chemical Sciences and Engineering, Ecole Polytechnique Federale de Lausanne, Lausanne, Switzerland

*Corresponding authors
S.-H.J.: shjin@pusan.ac.kr and N.-G.P.: E-mail: npark@skku.edu

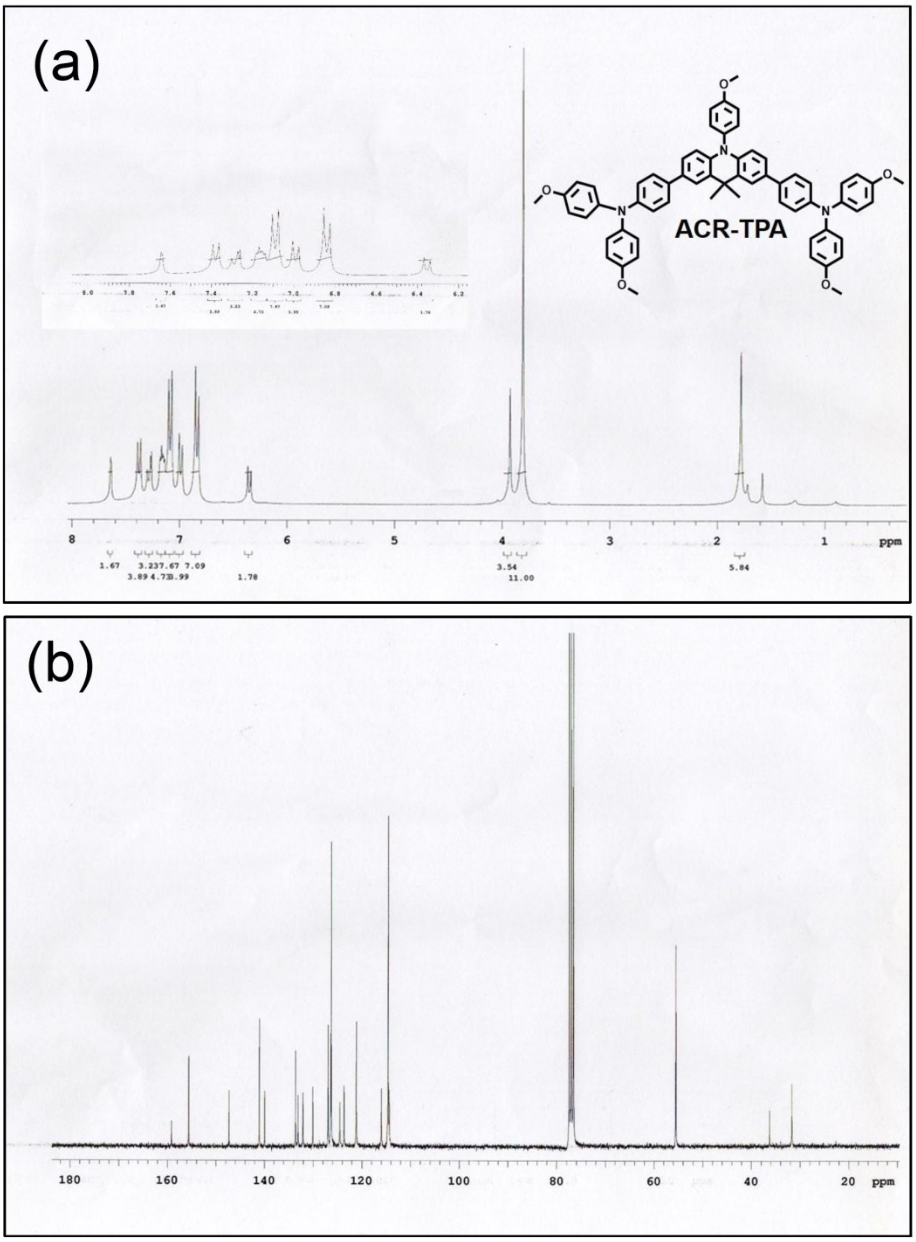

Figure S1. (a) ^{1}H and (b)^{13}C NMR spectra of ACR-TPA.

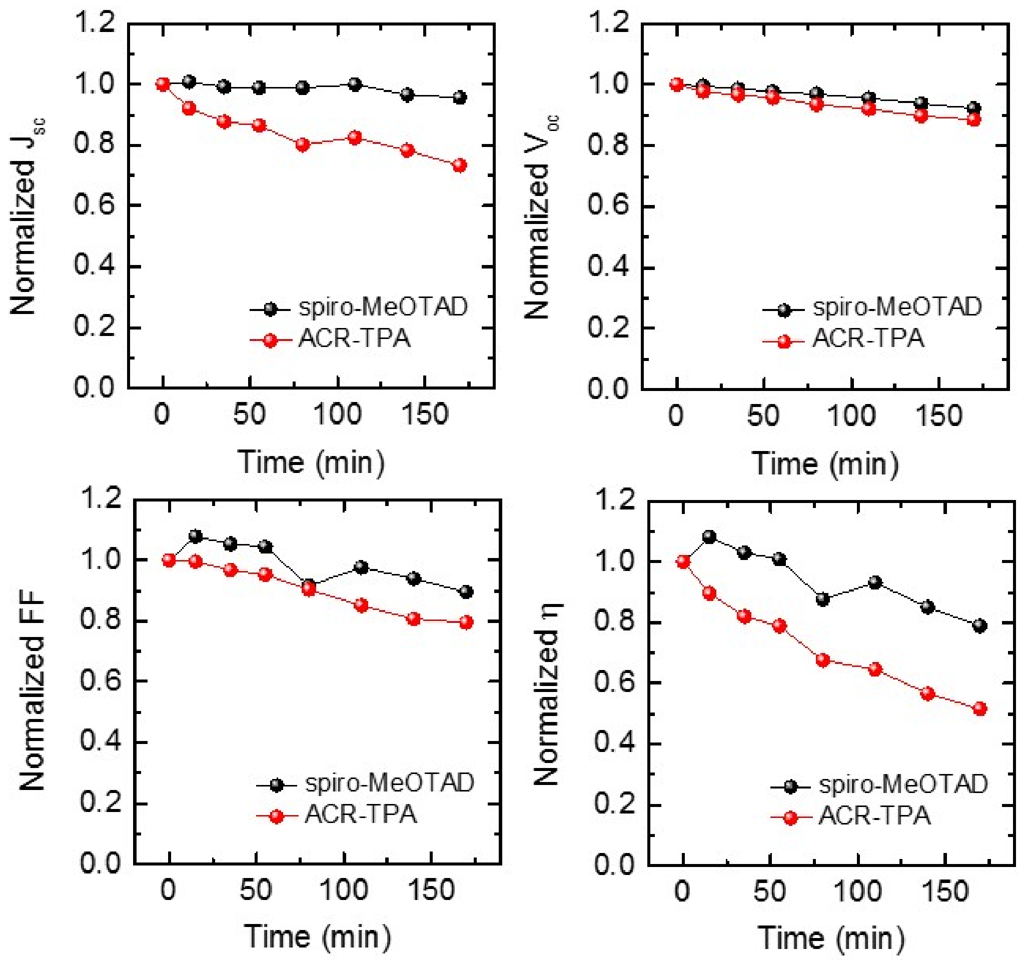

Figure S2. Normalized photovoltaic parameters as a function of light exposure time for the perovskite solar cells employing 250 nm-thick ACR-TPA (red) and spiro-MeOTAD (black). The devices were not encapsulated and measured under one sun illumination in air atmosphere (relative humidity of about ~20%, temperature of ~24 ^{o}C and device temperature of ~40 ^{o}C. Data were collected by revere scan at scan rate of 200 ms.

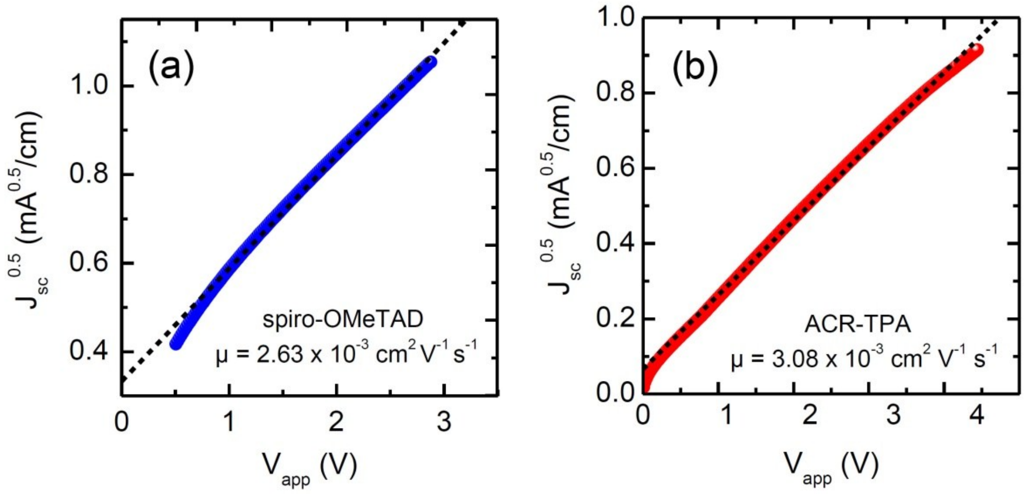

Figure S3. Hole mobility for (a) spiro-MeOTAD and (b) ACR-TPA with Li-TFSI and tBP additives measured by the space-charge-limited current (SCLC) method under dark condition. The sample consist of ITO/PEDOT:PSS/HTM/MoO_3/Al and the thickness of spiro-MeOTAD and ACR-TPA are 230 and 270 nm, respectively.

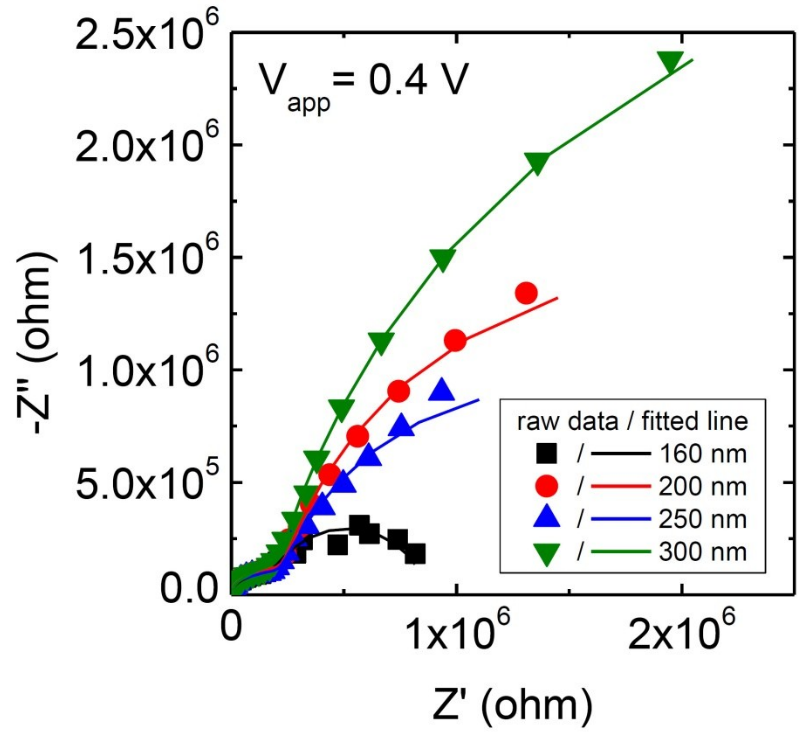

Figure S4. Nyquist plot for the ACR-TPA based solar cells at bias voltage of 0.4 V in the dark condition. Symbols and lines denote measured data and fitted data based on equivalent circuit having two resistance-capacitance RC components and one resistance component connected in series.

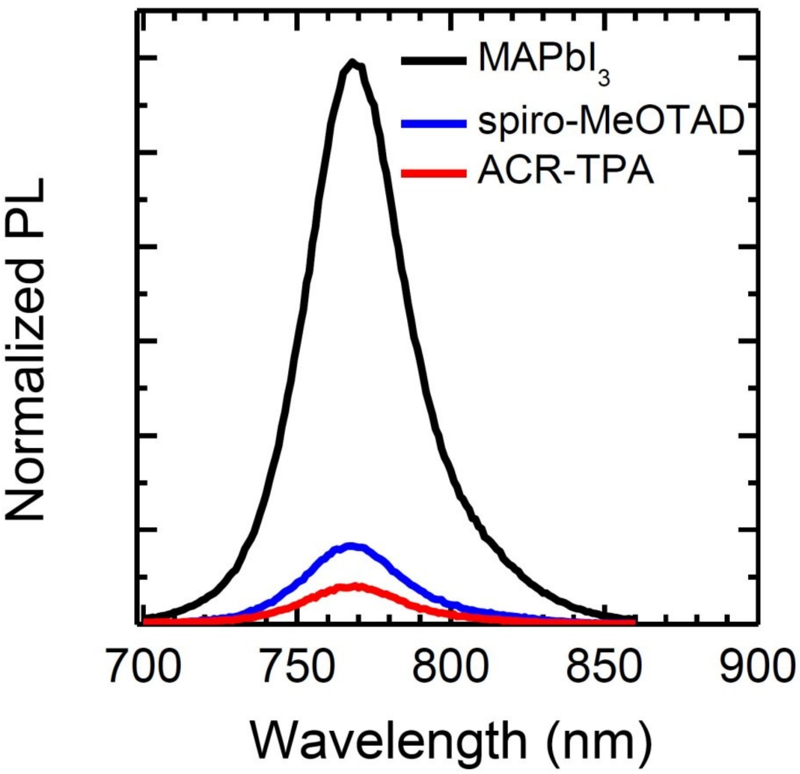

Figure S5. Time-integrated PL spectra of pristine $MAPbI_3$ perovskite film coated with PMMA (black), spiro-OMeTAD (blue) and ACR-TPA (red).