Electronic Supplementary Material (ESI) for Materials Advances.

Supporting Information

for

Enabling Water-Free PEDOT as Hole Selective Layer in Lead-Free Tin Perovskite Solar Cells

Diego Di Girolamo[1,†], Ece Aktas[1,†], Corinna Ponti[1,†], Jorge Pascual[2], Guixiang Li[3], Meng Li[3], Giuseppe Nasti[1], Fahad Alharthi[4], Francesco Mura[5] and Antonio Abate[1,3,4*]

[1]Department of Chemical, Materials and Production Engineering, University of Naples Federico II, Piazzale Tecchio 80, 80125, Fuorigrotta, Italy.

[2]Institute for Chemical Research, Kyoto University, Gokasho, Uji, Kyoto 611-0011, Japan

[3]Helmholtz-Zentrum Berlin für Materialien und Energie GmbH, 14109 Berlin, Germany.

[4]Chemistry Department, Science College, King Saud University, P O Box 2455 Riyadh 11451, Saudi Arabia

[5]Centro delle Nanotecnologie applicate all'Ingegneria della Sapienza – CNIS, University of Rome La Sapienza, Piazzale Aldo Moro 5, 00185, Rome, Italy

[†]Contributed equally to this work.

email of the corresponding author:

antonio.abate@unina.it

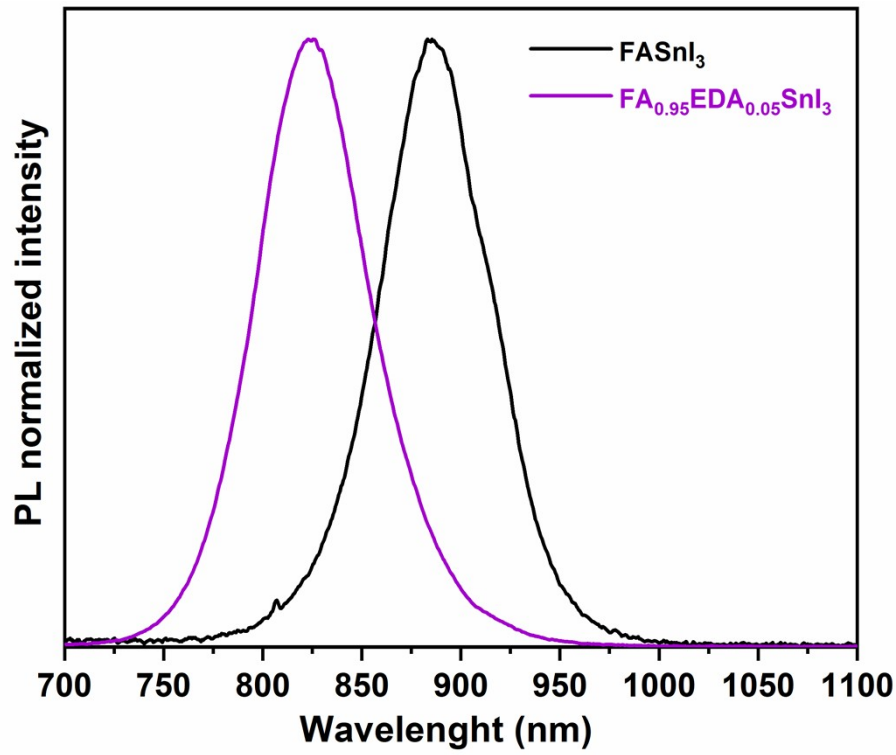

Figure S1. Normalized photoluminescence of perovskite films based on $FASnI_3$ with and without $EDAI_2$.

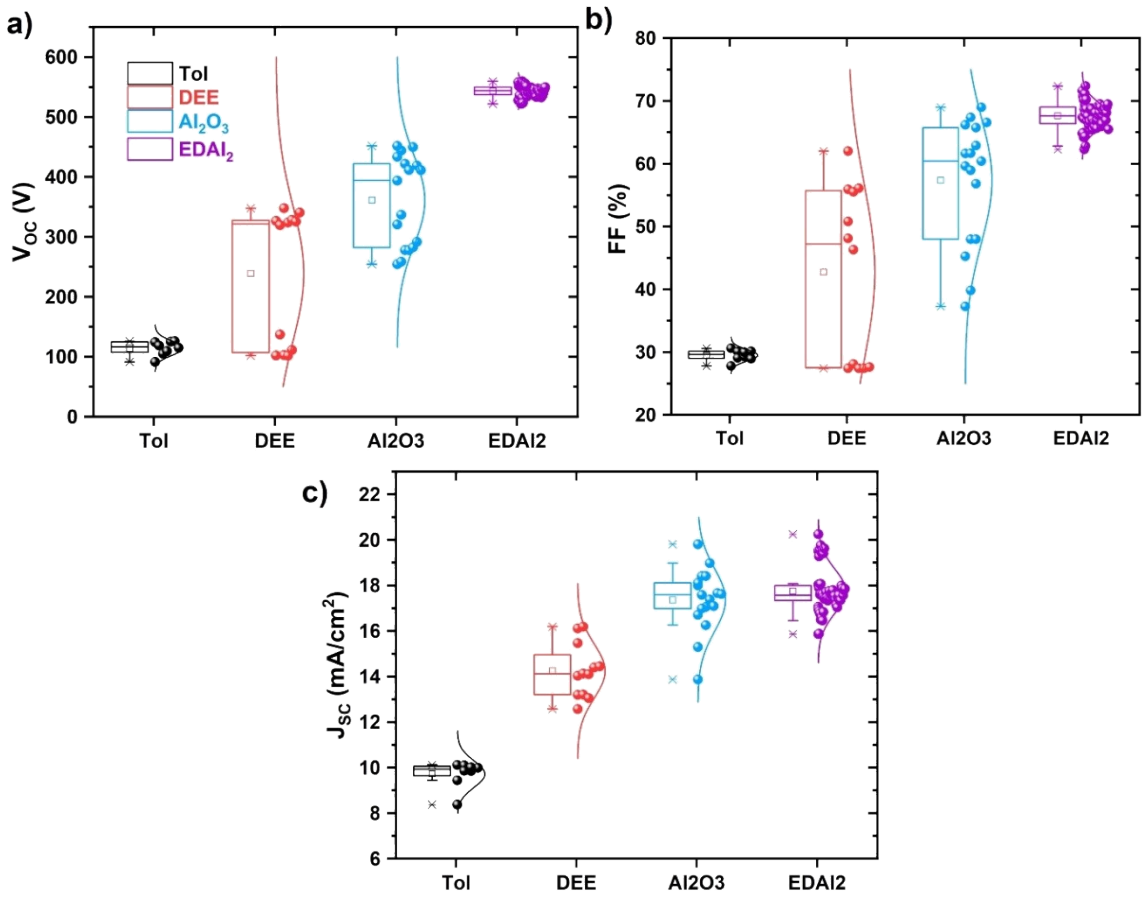

Figure S2. Statistical distribution of PV parameters for the different devices a) V_{OC} b) FF c) J_{SC}.

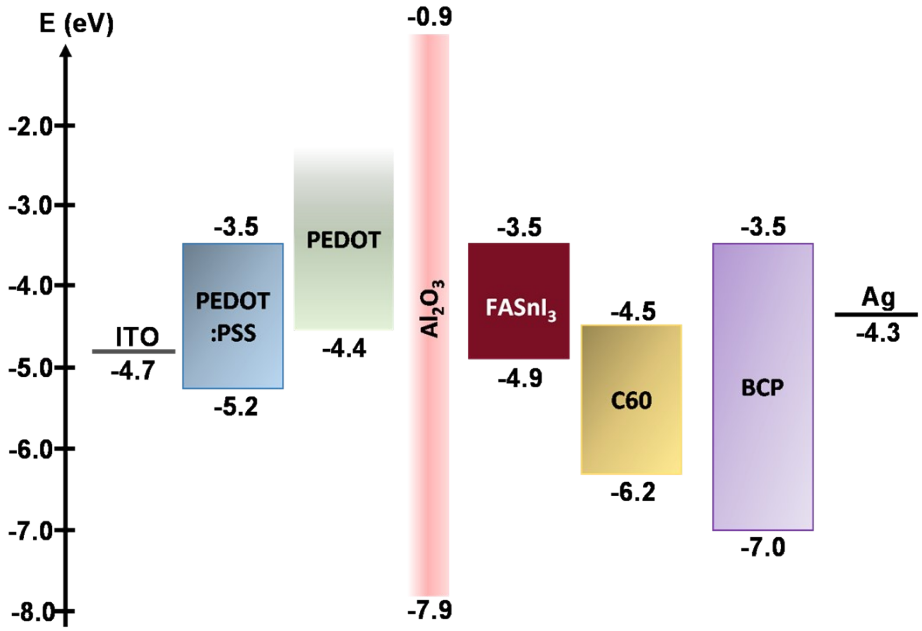

Figure S3. Energy diagram of utilised materials and $EDAI_2$-doped $FASnI_3$[1–3].

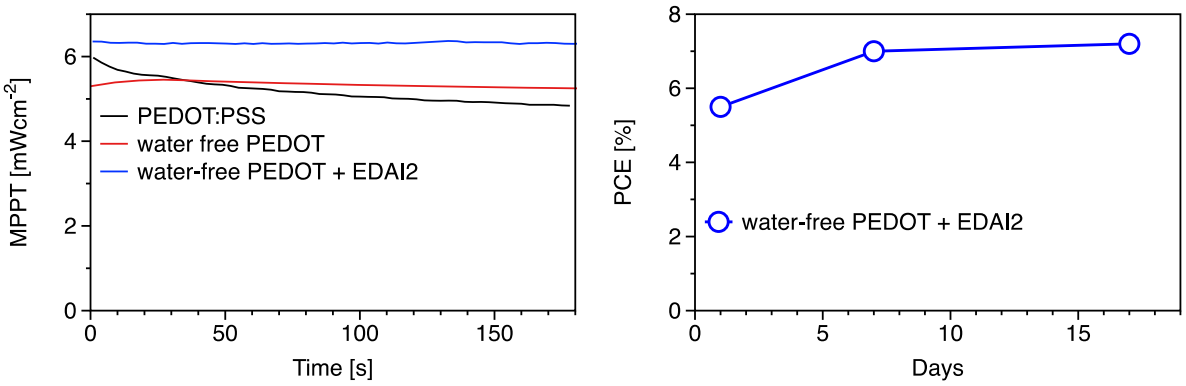

Figure S4. On the right we report the maximum power point tracking (MPPT) over three minutes for PEDOT:PSS based devices (black curve, detailed in ref 4) compared with the devices described in this work. On the right we show the PCE evolution with storage in glove box for a typical $EDAI_2$ containing device, showing a small improvement in PCE in the first days (similarly to previous reports (e.g., ref 5))

References

1 M. Wang, W. Wang, B. Ma, W. Shen, L. Liu, K. Cao, S. Chen and W. Huang, *Nano-Micro Lett.*, 2021, **13**, 62.

2 E. Jokar, C. H. Chien, C. M. Tsai, A. Fathi and E. W. G. Diau, *Adv. Mater.*, 2019, **31**, 1–7.

3 W. Chen, Y. Wu, J. Liu, C. Qin, X. Yang, A. Islam, Y.-B. Cheng and L. Han, *Energy Environ. Sci.*, 2015, **8**, 629–640.

4 D. Di Girolamo, J. Pascual, M. H. Aldamasy, Z. Iqbal, G. Li, E. Radicchi, M. Li, S. H. Turren-Cruz, G. Nasti, A. Dallmann, F. De Angelis and A. Abate, *ACS Energy Lett.*, 2021, 959–968.

5 M. Li, W. Zuo, Y. Yang, M. H. Aldamasy, Q. Wang, S. H. T. Cruz, S. Feng, M. Saliba, Z. Wang, A. Abate, *ACS Energy Lett.* **2020**, *5*, 1923.