Supporting Information for

High-performance Ruddlesden-Popper two-dimensional perovskite solar cells using integrated electron transport materials of tin oxide and indacenodithiophene

Zhihai Liu,[a] Lei Wang,[b] Hao Zhao,[a] Yibin Wei,[c] Xiaoyin Xie*[d] and Ping Chen*[a]

[a]*School of Physics and Electronic Information, Yantai University, Yantai, 264005, China, Email:* chenping@ytu.edu.cn

[b]*School of Artificial Intelligence, Beijing Technology and Business University, Beijing, 100048, China*

[c]*State Key Laboratory of High-efficiency Utilisation of Coal and Green Chemical Engineering, Ningxia University, Yinchuan 750021, China*

[d]*School of Chemistry and Chemical Technology, Hubei Polytechnic University, Huangshi 435003, China, Email:* xyxie@hbpu.edu.cn

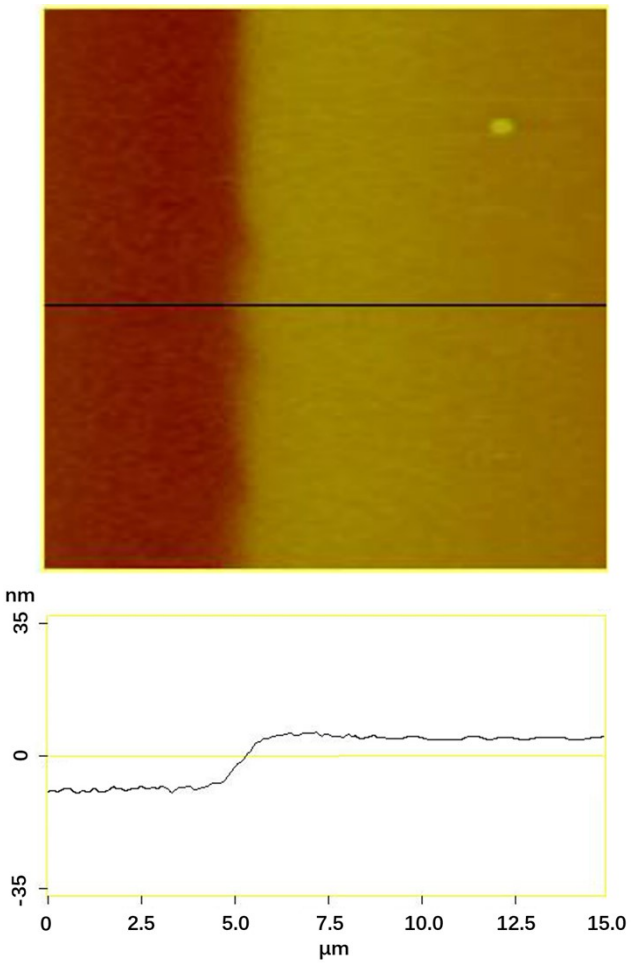

Fig. S1. AFM image for the surface of SnO_2/IDIC, in which IDIC (left part) was coated under a speed of 1500 rpm.

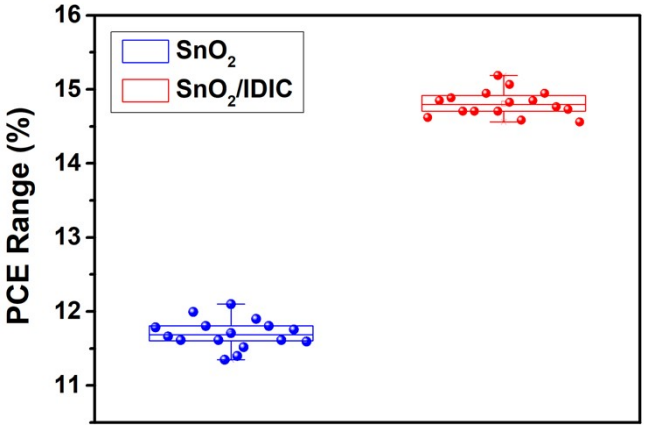

Fig. S2. PCE variations with standard deviations for PSCs without and with 1500 rpm processed IDIC films.

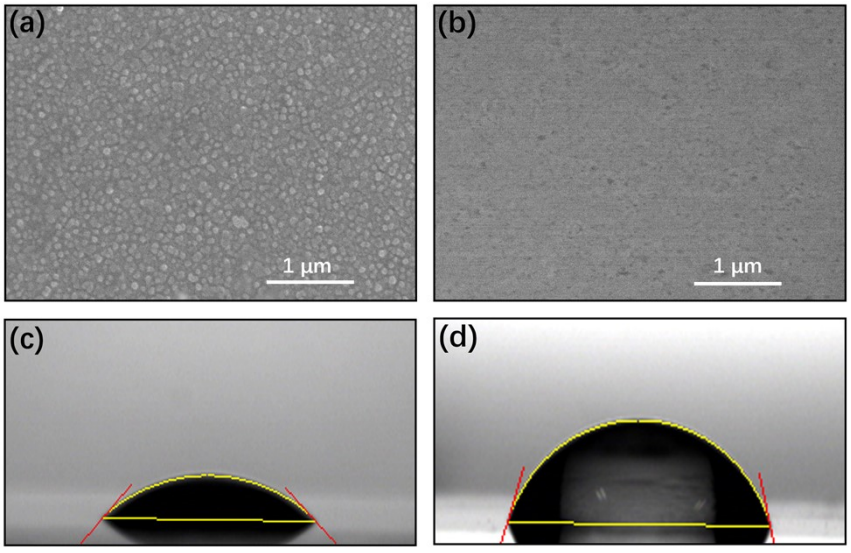

Fig. S3. Top-view SEM images of (a) bare SnO_2 and (b) SnO_2/IDIC films; Water contact angle measurements of (c) bare SnO_2 and (d) SnO_2/IDIC films.

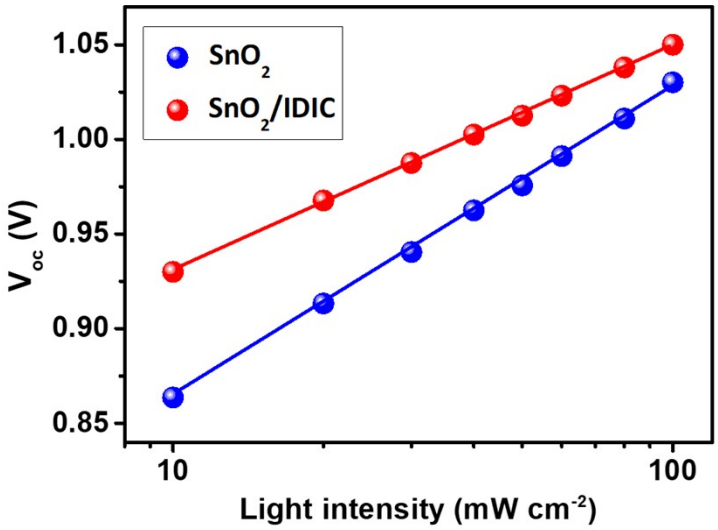

Fig. S4. Light intensity dependence of V_{oc} for PSCs using bare SnO_2 and SnO_2/IDIC as the ETLs.

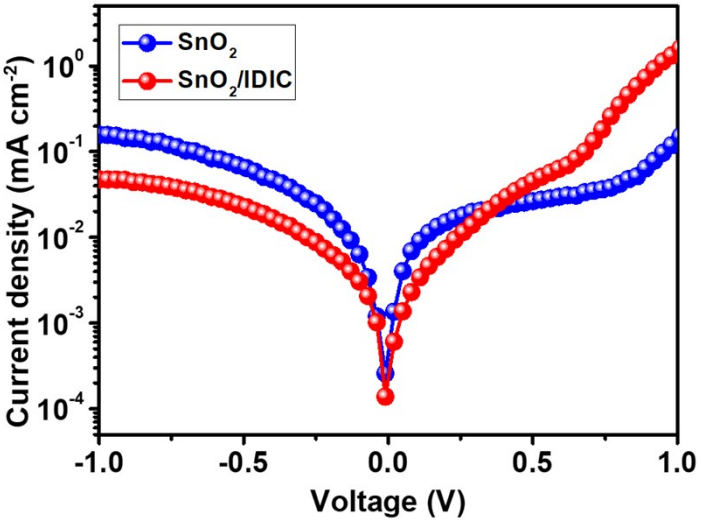

Fig. S5. Dark *J*–*V* characteristics for PSCs using bare SnO_2 and SnO_2/IDIC as the ETLs.

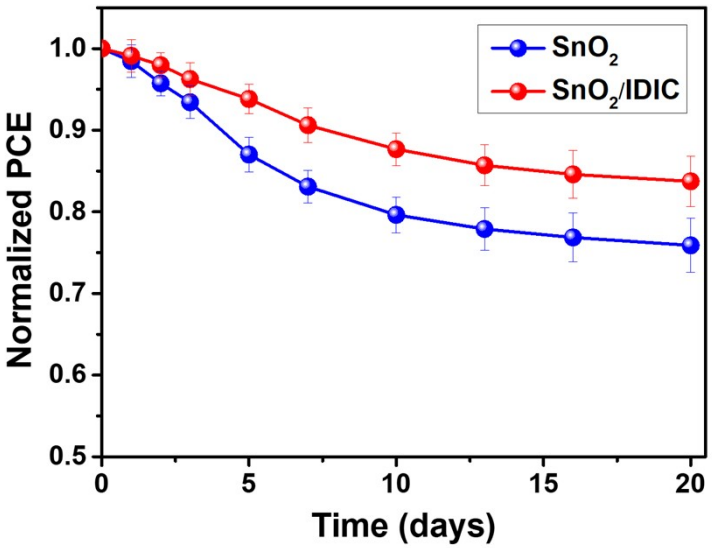

Fig. S6. Long-term stability test of the PSCs using bare SnO_2 or SnO_2/IDIC as the ETLs, in terms of the normalized PCE as a function of time.