Electronic Supplementary Material (ESI) for Journal of Materials Chemistry C.

Supporting information

Solution-processable $Ti_3C_2T_x$ nanosheets as an efficient hole transport layer for high-performance and stable polymer solar cells

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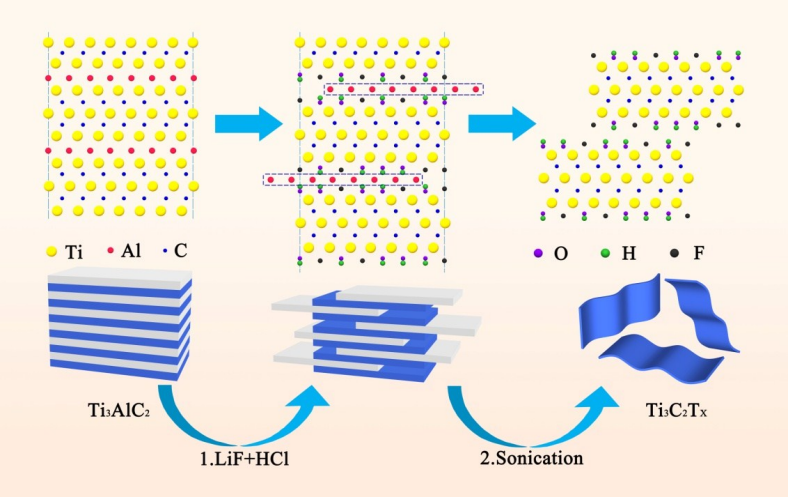
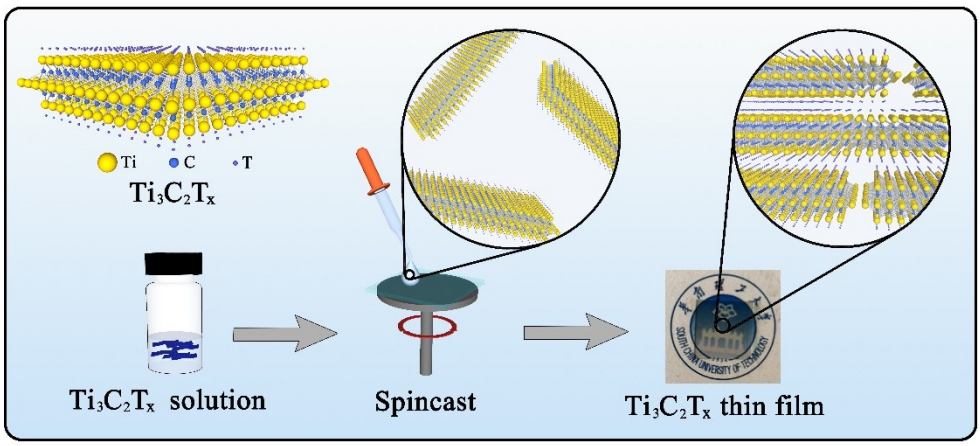


Scheme S1 Schematic illustration for the synthesis of $Ti_3C_2T_x$.



Scheme S2 Schematic illustration for the preparation of $Ti_3C_2T_x$ spin-casting film.

Table S1 Photovoltaic parameters of PSCs with different PEDOT:PSS thicknesses. All parameters are averaged from 10 devices.

PEDOT:PSS thickness (nm)	V_{oc} (V)	J_{sc} (mA cm^{-2})	FF (%)	PCE (%)
46	0.90	16.15	68.37	9.94 ± 0.11
41	0.90	16.12	68.82	9.98 ± 0.11
37	0.90	16.13	69.57	10.10 ± 0.11
34	0.90	16.10	68.24	9.89 ± 0.11
29	0.90	16.06	67.93	9.82 ± 0.11
25	0.89	15.98	67.34	9.82 ± 0.11

Fig. S1 The Tyndall scattering effect in $Ti_3C_2T_x$ solution.

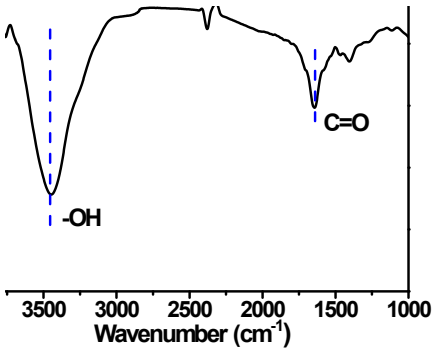


Fig. S2 FTIR spectrum of $Ti_3C_2T_x$.

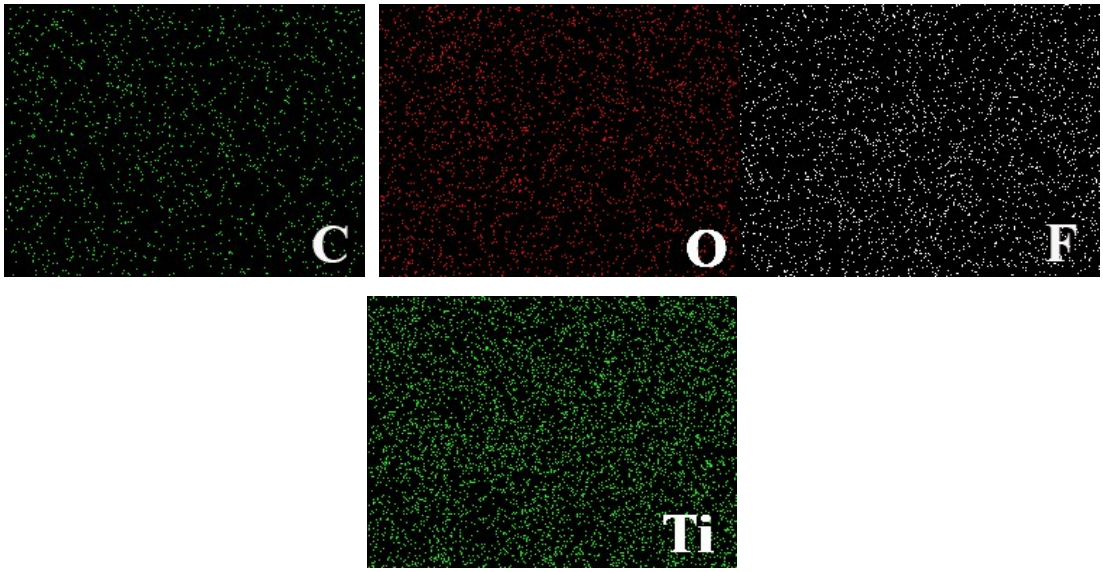


Fig. S3 Elemental maps of $Ti_3C_2T_x$.

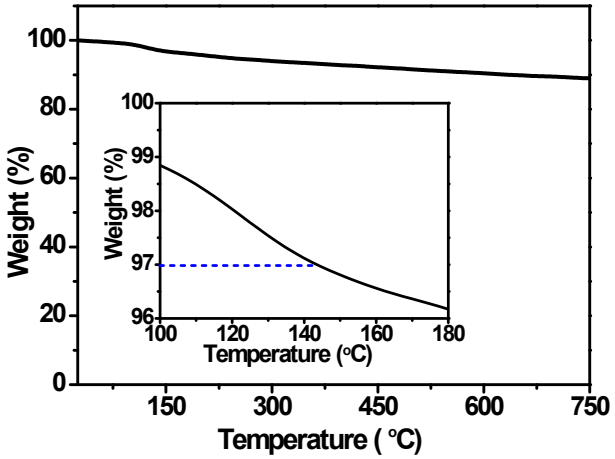


Fig. S4 TGA curve of $Ti_3C_2T_x$.

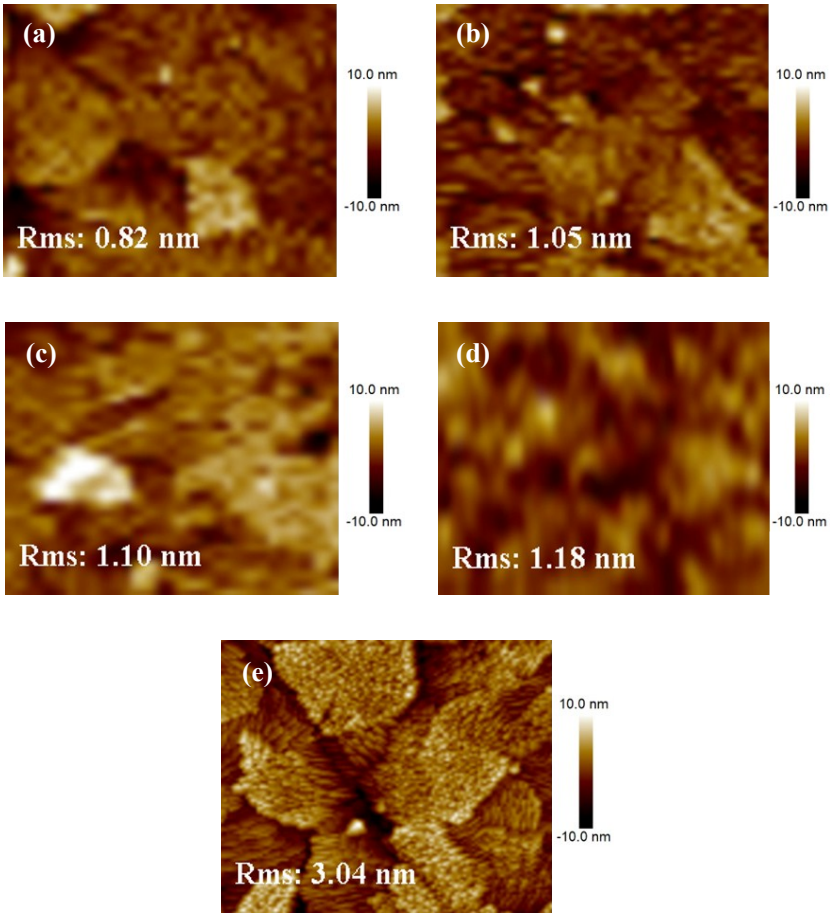


Fig. S5 AFM images of (a) $Ti_3C_2T_X$ (1.5 nm), (b) $Ti_3C_2T_X$ (3 nm), (c) $Ti_3C_2T_X$ (6 nm), (d) $Ti_3C_2T_X$ (15 nm), and (e) ITO only. All the images are 1 μm × 1 μm.

Table S2 The conductivities of the PEDOT:PSS and $Ti_3C_2T_x$ films on bare glass.

Device Configuration	Conductivity (S cm^{-1})
Glass/PEDOT:PSS	0.0068
Glass/$Ti_3C_2T_x$	4035.61

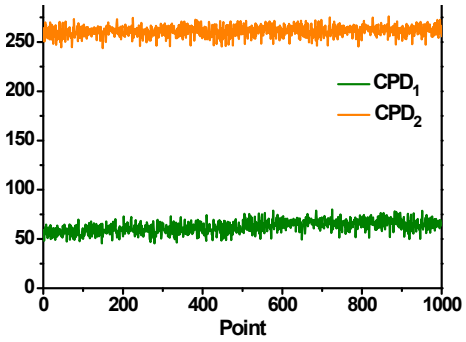
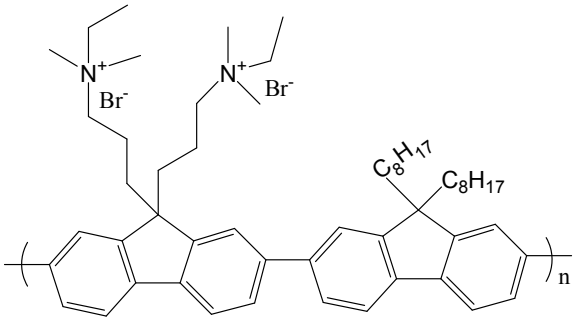


Fig. S6 CPD image of Au (CPD_1) sample and $Ti_3C_2T_x$ (CPD_2) related to the Au reference probe.



PFN-Br

Fig. S7 Chemical structure of PFN-Br.

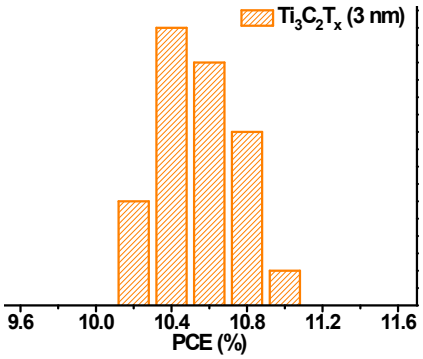


Fig. S8 Histogram of PCE counts for 24 devices based on $Ti_3C_2T_x$ (3 nm).