Electronic Supplementary Material (ESI) for Nanoscale.

Electronic Supporting Information for: *Solution-Processed Titanium Carbide MXene Films Examined as Highly Transparent Conductors*

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Multiple AFM analysis at different spots were taken, but we use Fig ESI 1a as an explanatory example of the single layer thickness measurement. A lateral slice was used for measuring the height variation, these are shown as blue and black bars in Fig ESI 1a. Then the distance between the highest point and the lowest point was measured and average of single flake height was obtained (1.5 ± 0.2 nm). Plotted in Fig ESI 1b is the slice height for these two different bars, the height of a single flake on top of the substrate is shown in black and in blue is depicted the height of a flake on another flake, in both zones the total thickness was maintained.

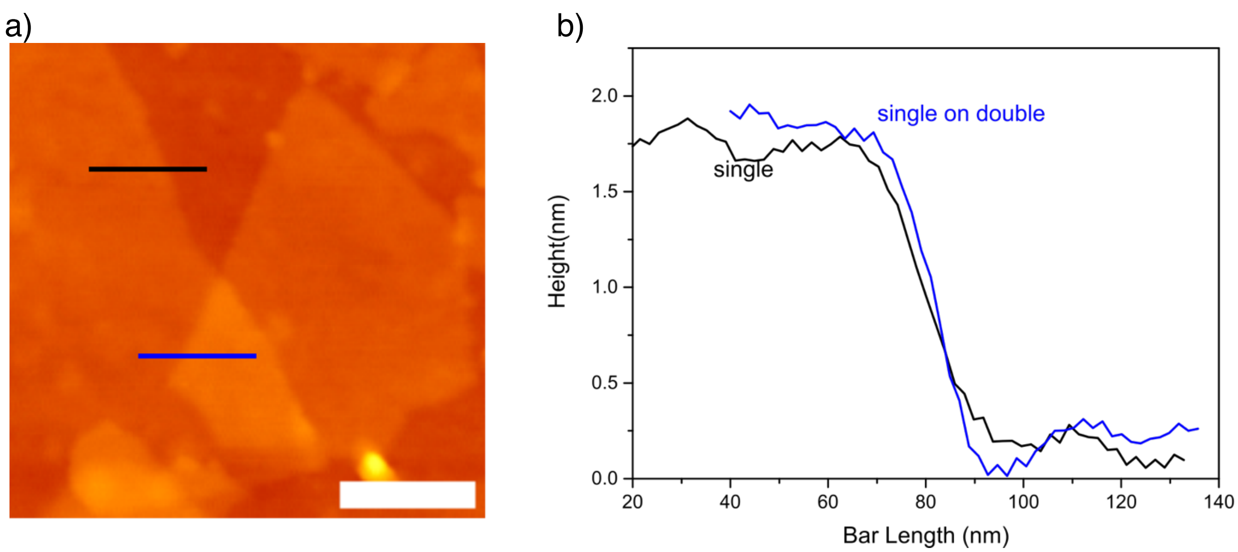

Fig ESI 1. Measured thicknesses of single flakes. a) AFM image of a low density of flakes using a 1000rpm spin rate. The white bar corresponds to 100nm. b) Plotted height slices corresponding to two different zones of the AFM image, in blue is shown the height of a flake on top of another and in black is shown the height of a flake on top of the substrate.

A maximum thickness of the sample is also measured using the difference between the highest point and the substrate, the latter identified by the image's dark zone

Table ESI 1. Summary of AFM measurements of the samples in Fig. 1 of the paper.

Spin Rate	Numb of flakes staked	Total thickness	Roughness
1000 rpm	2	1.5 ± 0.2nm	0.7 nm
800 rpm	3	3.0 ± 0.2 nm	1.3 nm
600 rpm	4	6.2 ±. 0.5 nm	1.6 nm
400 rpm	5	7.4 ± 0.5 nm	3.1 nm

A representative of a treated SEM image containing several isolated flakes is shown in Fig ESI 2a. The area of each flake was measured and then the lateral length is extracted assuming a circular shape. Using all the measured flakes a statistical analysis is performed and shown in Fig ESI 2b. A log-normal distribution is fitted over the counts per size and the lateral length was found to be 110.5 ± 0.5 nm.

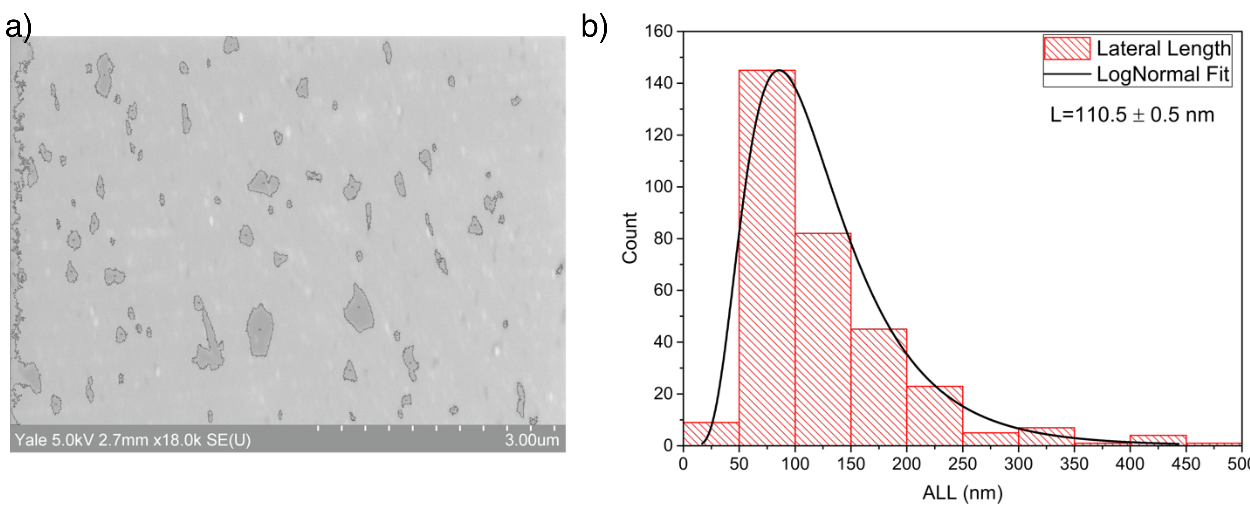

Fig ESI 2. Statistical analysis of the lateral size of isolated flakes. a) SEM image of a silicon substrate covered with MXenes that have been deposited at 1200rpm. b) Lateral size distribution of from all the SEM images containing isolated flakes. Represented in black is the fitted log-normal distribution.

The optoelectronic properties of different solution-processed electrodes are described in the Table ESI 2. Other carbon nanostructures and polymers are added for completeness of the work.

Table ESI 2. Comparison of optoelectronic properties of different solution-processed electrodes.

Material	%Transmission@550nm	σ_{dc}/σ_{oc}	R_{sh} (Ω/sq)	Conductivity ($S \cdot cm^{-1}$)	Ref.
VS_2	–	–		5	[1]
1T MoS_2	–	–		10 - 100	[2]
Reduced-GO	80	1.6	1000	1000	[3]
Pressure-rGO	78	1.4	1000	–	[4]
PEDOT:PSS	90	36.3	448	1400	[5]
SWNTs	75	11.5	100	–	[6]
$Ti_3C_2T_x$	77	3.1	437	3092	Here

Kelvin Probe AFM measurements were carried out in air on clean substrates with deposited delaminated flakes of $Ti_3C_2T_x$, the results are shown in Fig ESI 3. Fig ESI 3a and c correspond to AFM images of the sample, the brighter zone corresponds to the $Ti_3C_2T_x$ flakes clusters for Fig ESI 3 a or single for c. The potential readings of each sample are shown at their right (Fig ESI 3b and d). We observe that there is a change in the potential when the MXene flakes are present and such change is the same for clusters or single flakes. After calibrating the tip with a known gold reference, we extracted the work function of our material. The result was averaged for different samples and a mean work function was found to be 5.28 ± 0.03 eV.

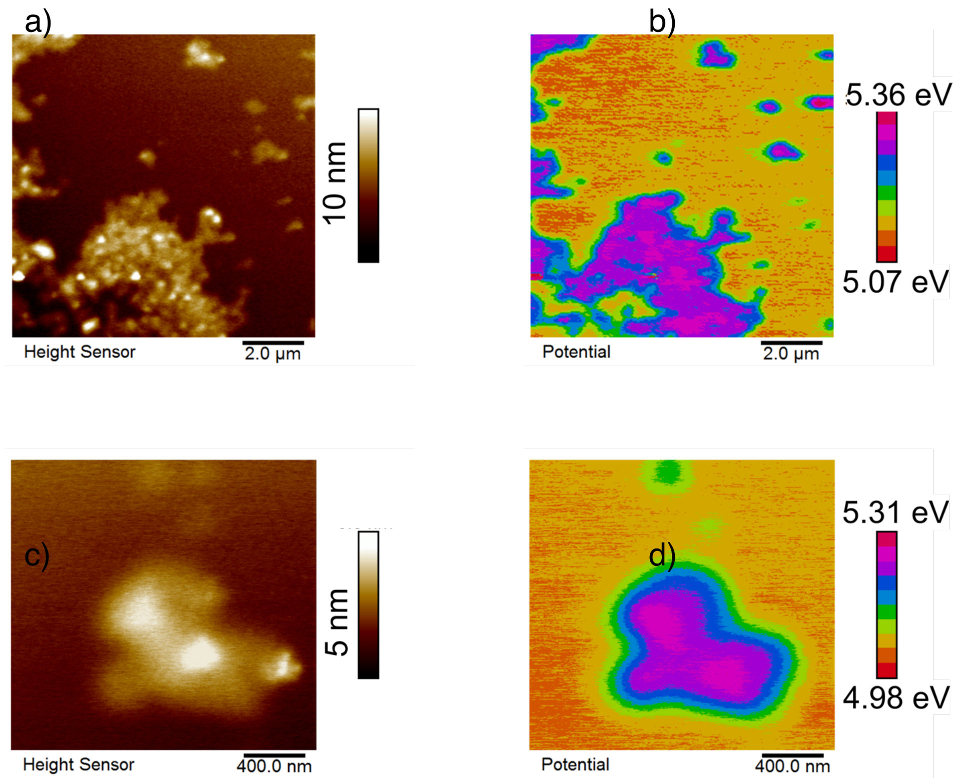

Fig ESI 3. KPFM measurements of $Ti_3C_2T_x$ flakes onto silicon substrates. a) and b) are AFM and Potential images of a stack of MXenes flakes respectively. c) and d) are a more detailed AFM and Potential measurements of a single flake. On both types of samples, the measured work function of the flakes has the same values, as can be seen for the similar scale shown in b) and c).

References

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