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Supplementary Materials: All-Inkjet-Printed Ti_3C_2 MXene Capacitor for Textile Energy Storage

Eugenio Gibertini *, Federico Lissandrello, Luca Bertoli, Prisca Viviani and Luca Magagnin *

Dipartimento di Chimica, Materiali e Ingegneria Chimica "Giulio Natta", Politecnico di Milano, Via Mancinelli, 7-20131 Milano, Italy
* Correspondence: eugenio.gibertini@polimi.it (E.G.); luca.magagnin@polimi.it (L.M.)

The XRD pattern of Ti_3AlC_2 (Figure S1) shows the typical set of multiple diffraction peaks relative to the MAX phase (JCPDS 98-018-2475) and no evident secondary phase as TiC were detected [1–3]. Commonly, the shift to lower diffraction angles of the (002) plane is considered as fingerprint of successful etching of Al planes [3]. After 36 h of etching, the peak of the (002) plane broadened and shifted from 9.5° (MAX) to 6.7° and 7° respectively. These results are well coherent with the MAX to Ti_3C_2 MXene conversion as result of Al removal, introduction of functional groups on MXene surface, intercalated ions (Li^+) and water molecules in the interlayers of hydrophilic MXenes [1,4].

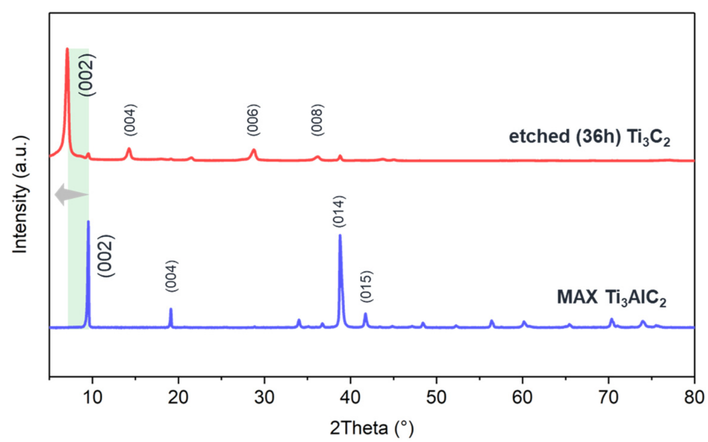

Figure S1. XRD patterns for the Ti_3AlC_2 MAX and the etched Ti_3C_2 MXene after 36 h etching.

SEM analyses are usually able to reveal multilayer MXene formation after etching. The typical layered structured of the Ti_3AlC_2 MAX is clearly visible in Figure S2a. After etching process, exfoliated flakes are evident (Figure S2b) with the peculiar "open-book" morphology of the bigger flakes [3,5,6] as result of Al etching and interlayer expansion. The EDS spectra of the MAX (Figure S2c) and etched Ti_3C_2 multilayer MXenes (Figure S2d) revealed a drastic decrease of the Al peak and raise of F and Cl as typically result for the Ti_3AlC_2 MAX etching in the HCl/LiF system.

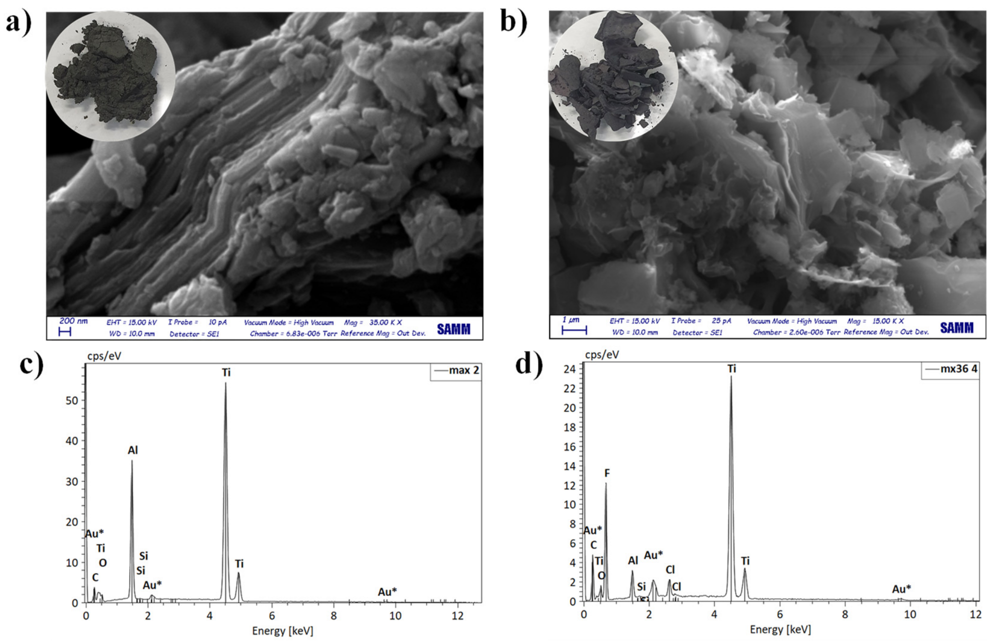

Figure S2. SEM images of the Ti_3AlC_2 MAX (**a**) and multilayer etched Ti_3C_2 MXene (**b**). In (**c**) and (**d**) the EDS spectra for the MAX and etched multilayer MXene powder are provided.

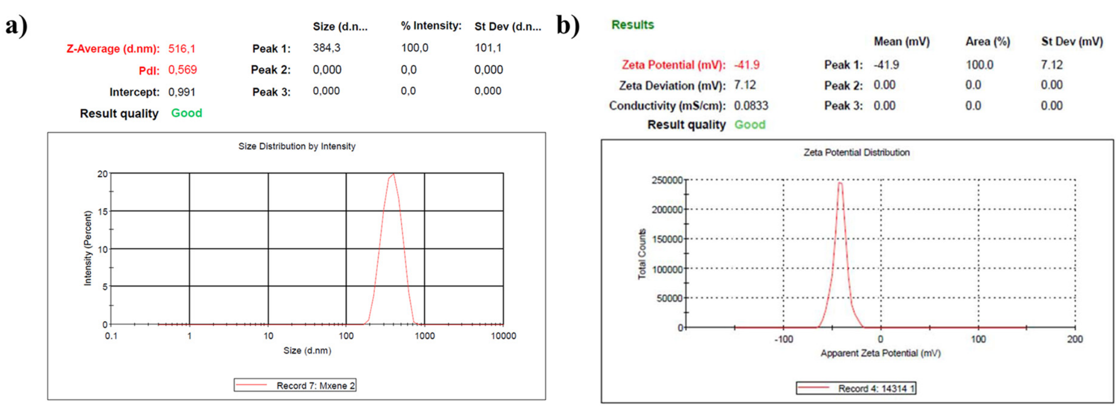

Figure S3. DLS (**a**) and Z-potential (**b**) file report of the Ti_3C_2 ink.

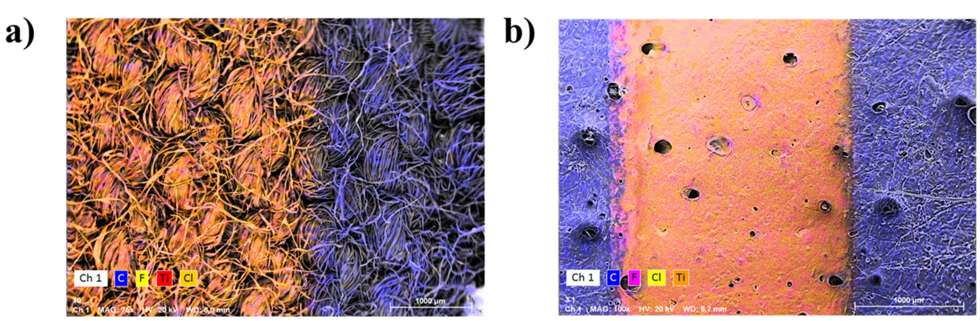

Figure S4. EDS image of the Ti_3C_2 MXene printed on the neat cotton fabric (**a**) and TPU-coated fabric (**b**).

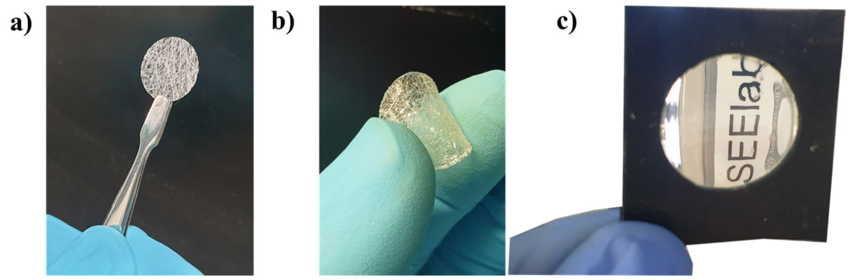

Figure S5. (**a**) a glass fibre separator was used as support matrix for ionic conductivity measurement; (**b**) the separator was soaked in the electrolyte precursor and then UV-cured for few seconds, a soft and flexible GPE was obtained; (**c**) when the electrolyte precursor was casted in a mould and then UV-cured, a free-standing transparent GPE was obtained.

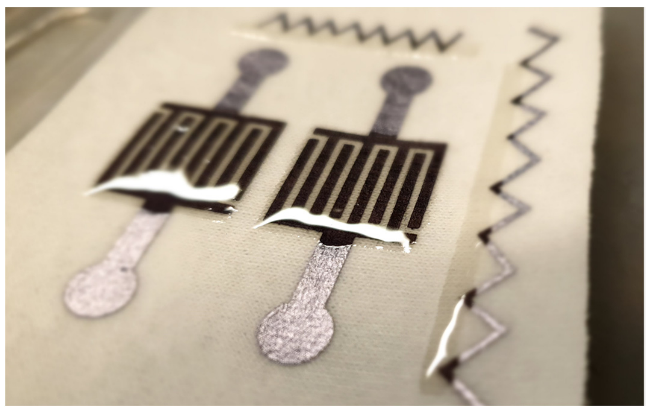

Figure S6. Real picture of a 1.5 cm² a-IJPSC produced with 0.6 mm interelectrode spacing, Ti_3C_2 20 L and electrolyte 30 L. The UV-cured GPE is clearly visible as a reflecting transparent coating on top.

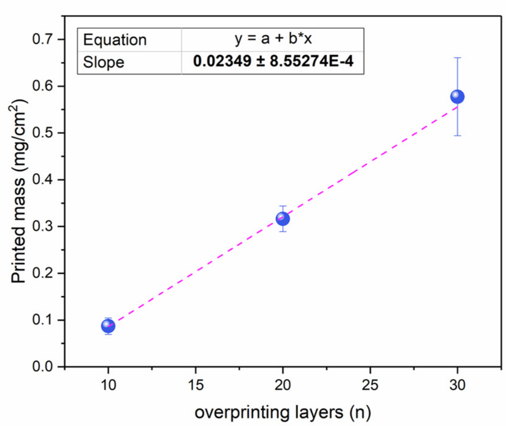

Figure S7. The printed Ti_3C_2 mass/layer normalized on printed area.

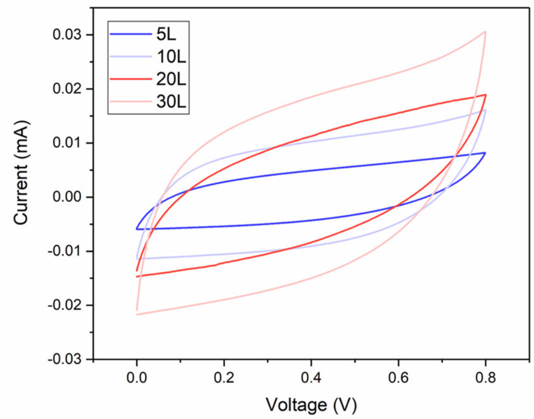

Figure S8. Cyclic voltammetries at 5 mV/s for a-IJPSC devices printed on TPU/Co with increasing Ti_3C_2 overprinting layers and 30 L of electrolyte precursor printing.

References

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