applied sciences

MDPI

Article

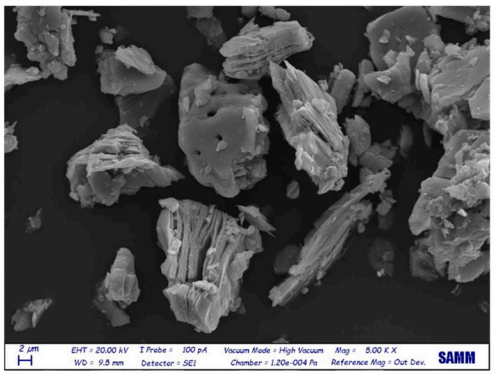
Zinc plating on inkjet printed $Ti_3C_2T_x$ MXene: effect of electrolyte and PEG additive

Prisca Viviani, Eugenio Gibertini*, Vittorio Montanelli, Luca Magagnin

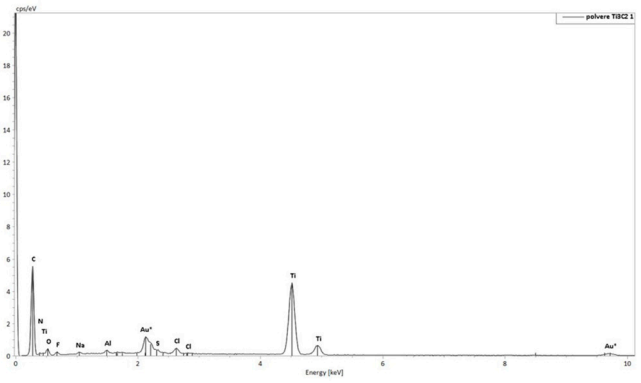
Dipartimento di Chimica, Materiali e Ingegneria Chimica "Giulio Natta", Politecnico di Milano, Via Mancinelli, 7, 20131 Milano, Italy

* Correspondence: eugenio.gibertini@polimi.it

a)



b)



c)

Atomic concentration [%]

spectrum	Fluorine	Aluminium	Chlorine	Titanium
powder Ti3C2 5	28,45	3,95	3,04	64,56
powder Ti3C2 4	28,62	3,20	3,29	64,90
powder Ti3C2 3	34,92	2,12	3,28	59,67
powder Ti3C2 2	42,83	1,43	2,65	53,09
powder Ti3C2 1	28,01	2,03	3,01	66,96
Mean	**32,56**	**2,55**	**3,05**	**61,84**
Sigma	**6,41**	**1,01**	**0,26**	**5,57**
Sigma mean	**2,87**	**0,45**	**0,12**	**2,49**

Figure S1. (a) SEM image of the multi-layered $Ti_3C_2T_x$ flakes after etching step and (b,c) the corresponding EDX quantiative analysis results.

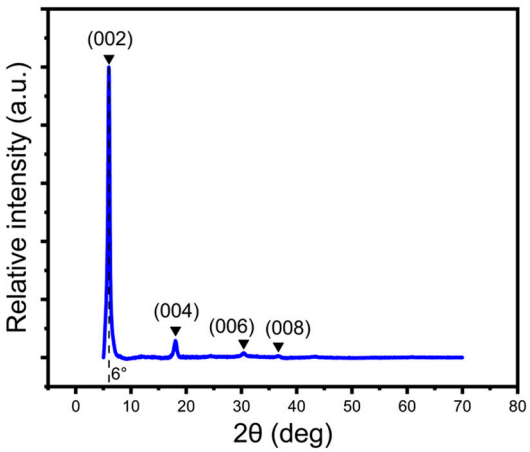


Figure S2. XRD pattern of the delaminated $Ti_3C_2T_x$ MXenes. For the analysis, a diluted delaminated $Ti_3C_2T_x$ aqueous suspension was vacuum filtered and dried to obtain a free-standing $Ti_3C_2T_x$ film.

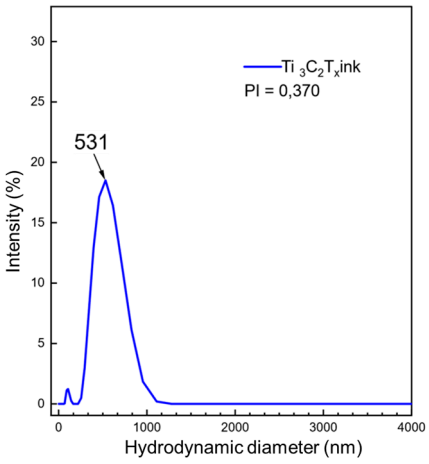


Figure S3. DLS of the $Ti_3C_2T_x$ ink employed for electrode MXene-coated electrode preparation.

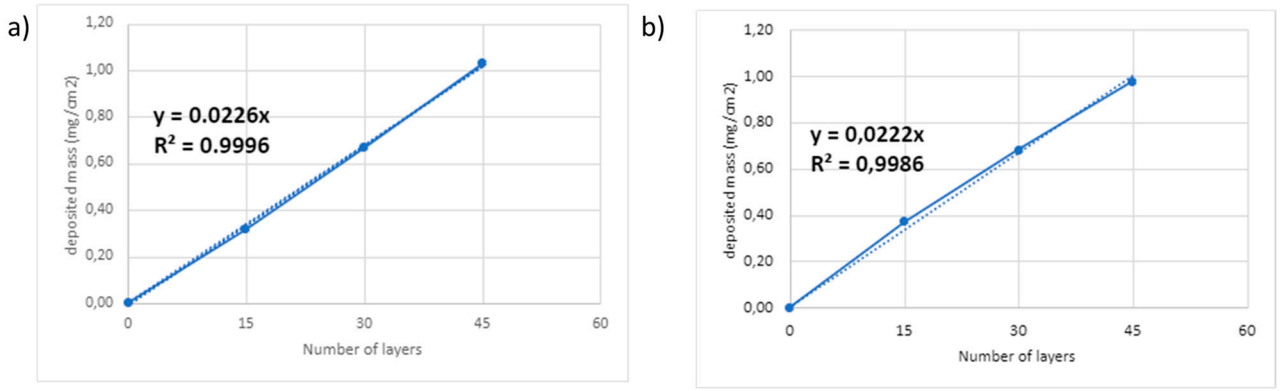


Figure S4. Deposited areal (dry) $Ti_3C_2T_x$ mass loaded as function of overprinting layers with a) the fresh ink and b) aged ink after 50 days of storage.

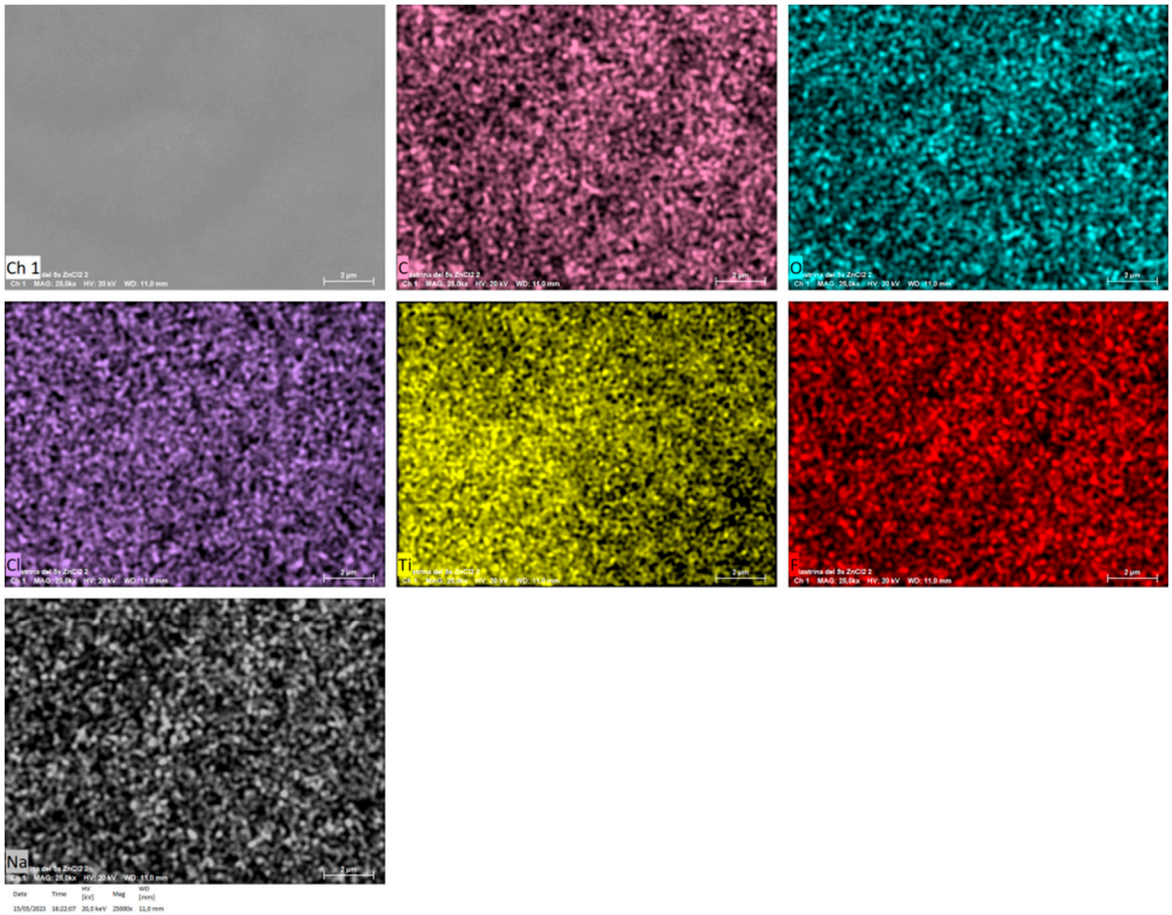


Figure S5. EDX mapping of the 20 layer printed $Ti_3C_2T_x$ on SS316 disk substrate.

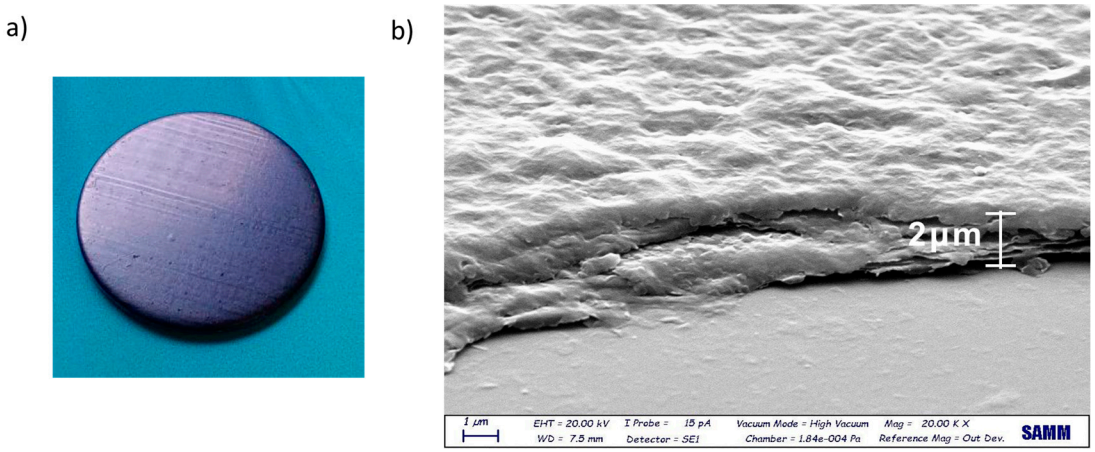


Figure S6. (a) Picture of the SS316 disk coated with 20 layer of $Ti_3C_2T_x$ by inkjet printing. The typical bright bluish colour the $Ti_3C_2T_x$ MXene is visible. In (b) is reported the SEM of the cross section of the $Ti_3C_2T_x$ coating, showing a thickness of roughly 2 µm.

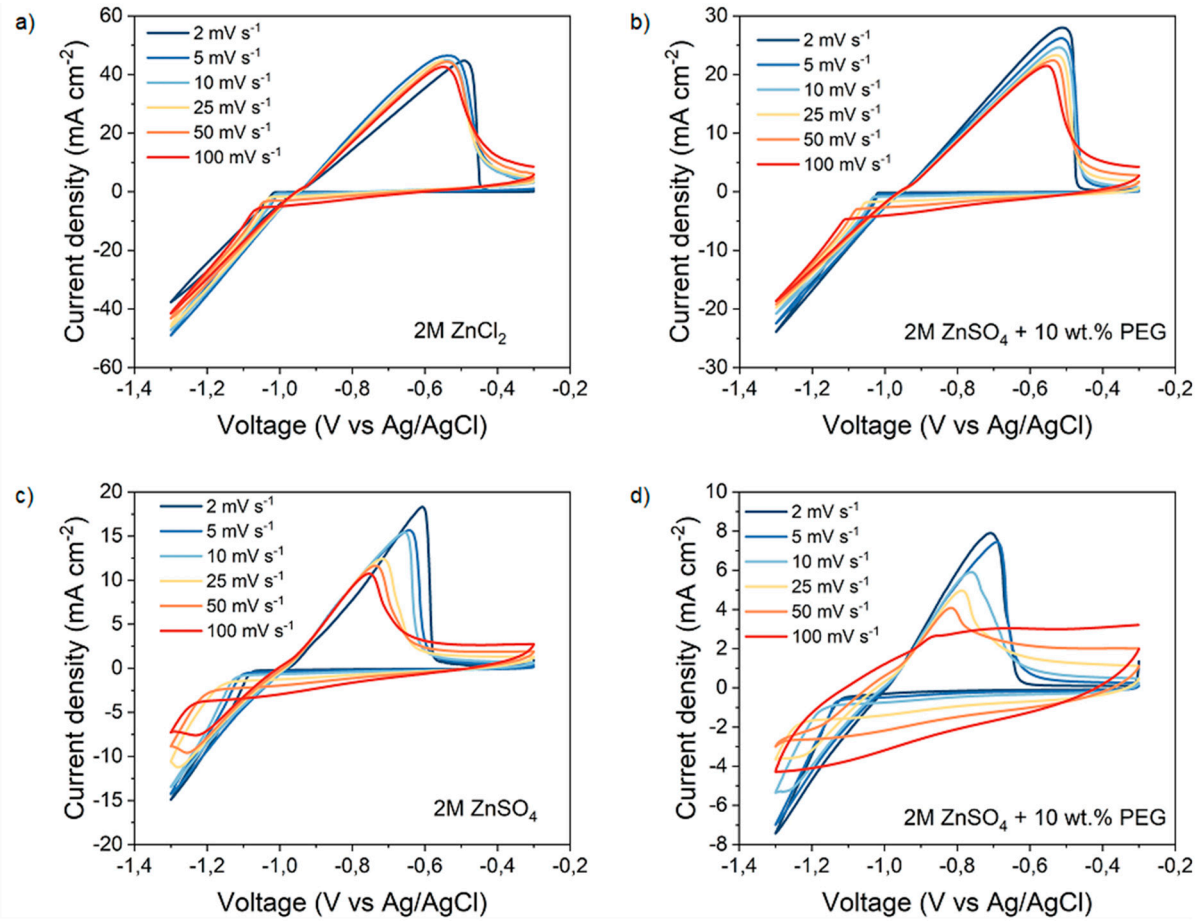


Figure S7. CVs of $Ti_3C_2T_x$ electrode in different electrolytes, i.e. 2M $ZnCl_2$ (a), 2M $ZnCl_2$ + 10 wt.% PEG (b), 2M $ZnSO_4$ (c) and 2M $ZnSO_4$ + 10 wt.% PEG (d), recorded varying scan rate, i.e. 2, 5, 10, 25, 50, 100 mV s^{-1}.

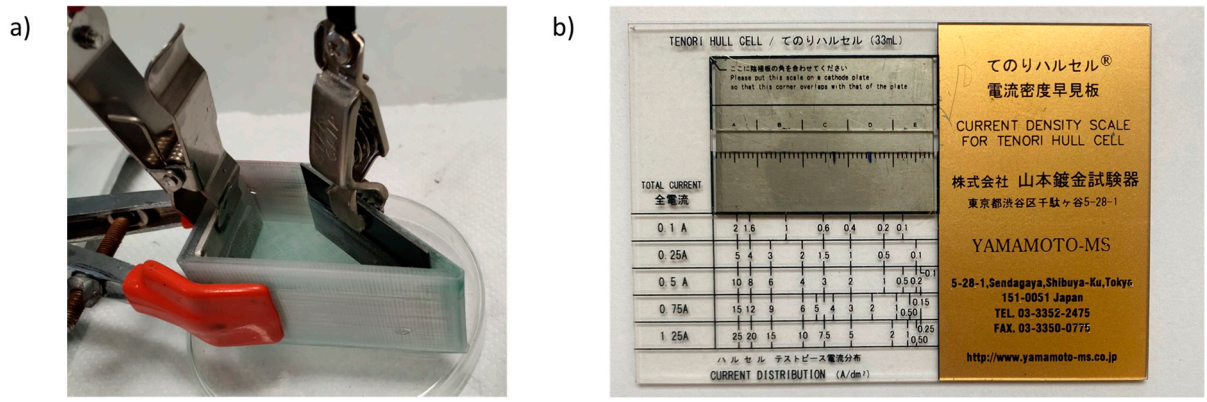


Figure S8. (a) picture of the Hull-cell employed in this work. The $Ti_3C_2T_x$ coated SS316 plate is placed on the oblique side of the trapezoidal cell while a Pt plate on the short side of the cell; (b) card for the local current density estimation with the cathode coupon underneath.

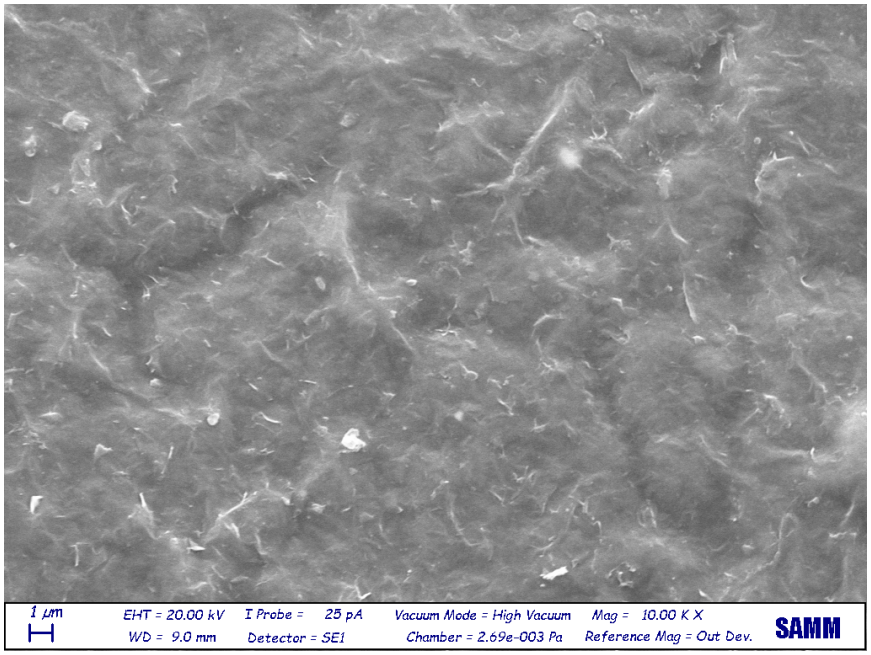


Figure S9. SEM image of the pristine $Ti_3C_2T_x$ coated electrode.