Supplemental Material

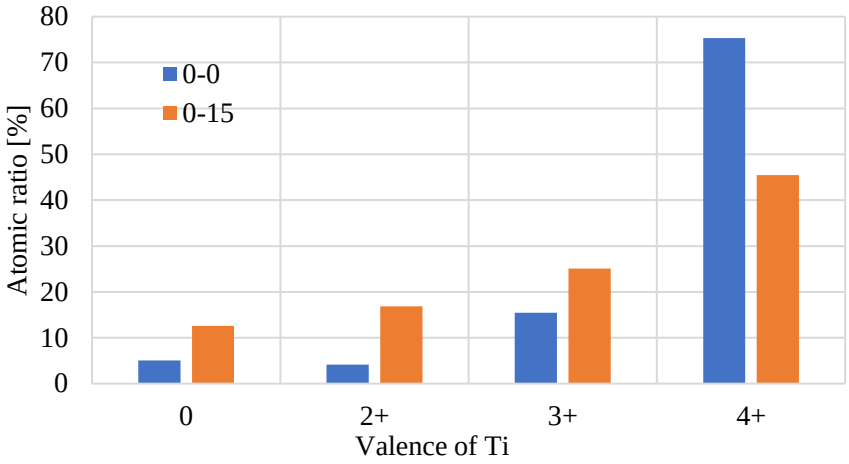


Fig. S1 Atomic ratio of Ti for different valence

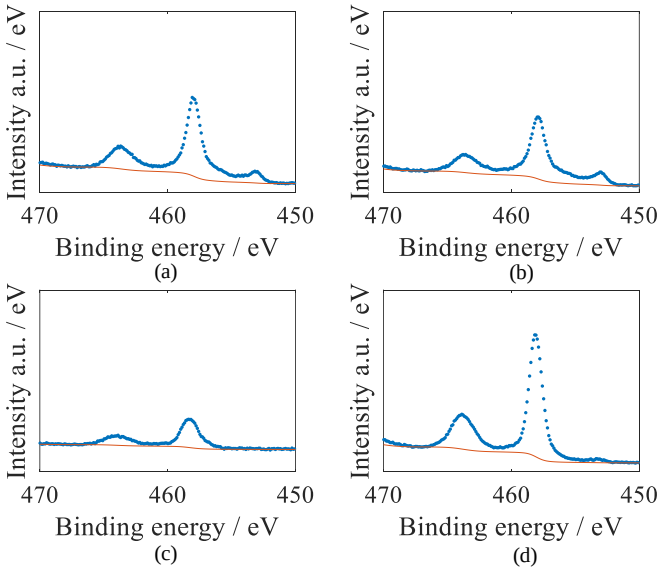
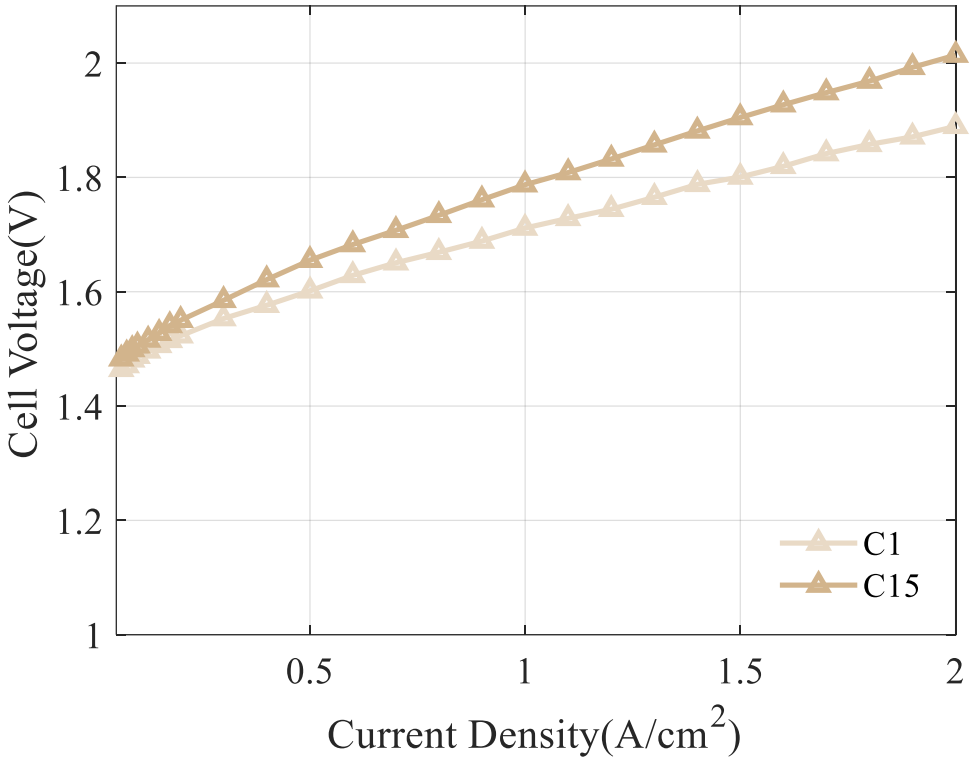
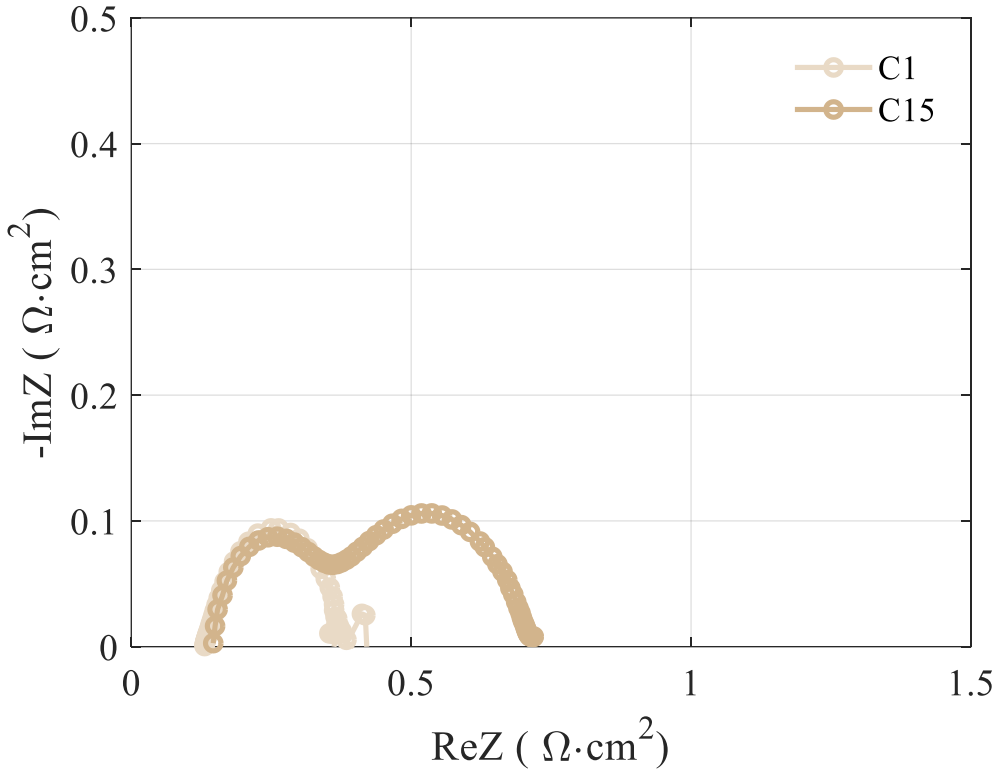


Fig. S2 Raw data of Ti 2p XPS results: (a)EA-48-15 PTL before I-V test. (b) 48-15 PTL before I-V test. (c) EA-48-15 PTL after I-V test. (d) 48-15 PTL after I-V test

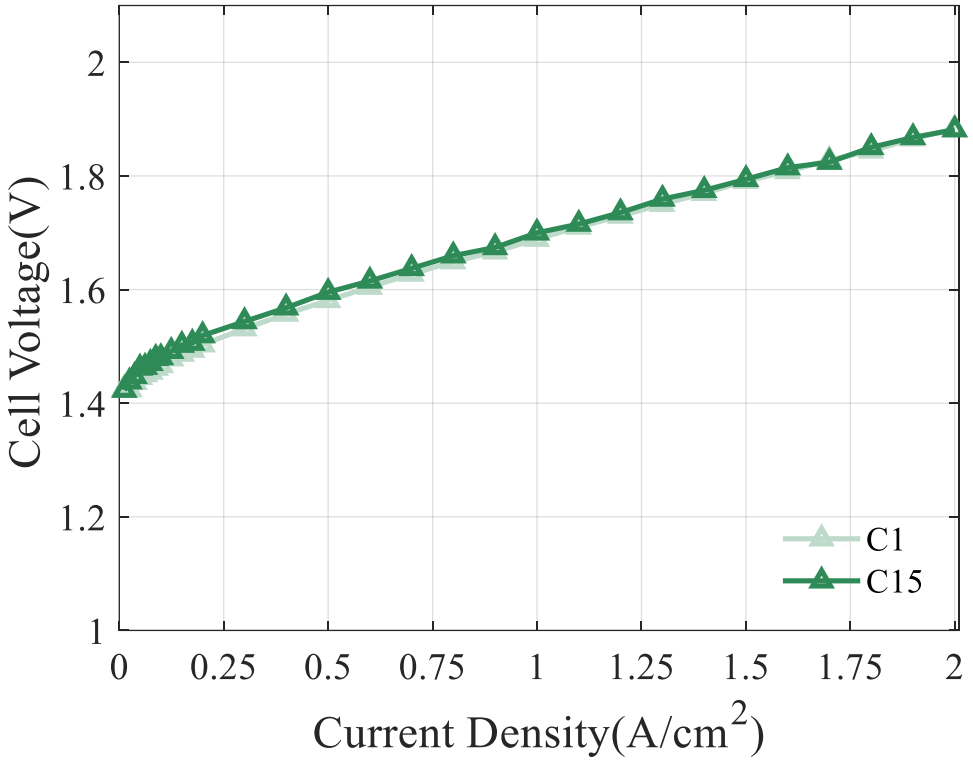


(a) I-V curves for the C1 and C15 circles.

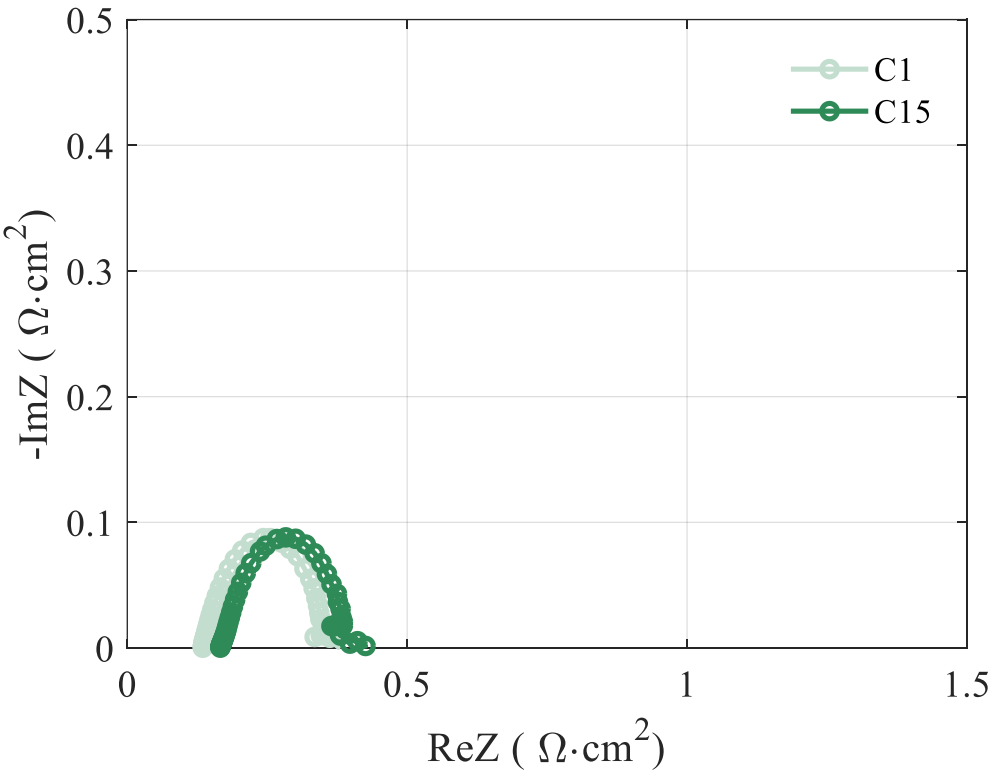


(b) EIS curves @ 0.1 A·cm^{-2} for the C1 and C15 circles.

Fig. S3 Electrochemical performance of the electrolyzer with 48-15-Pt PTL in 15-cycle testing

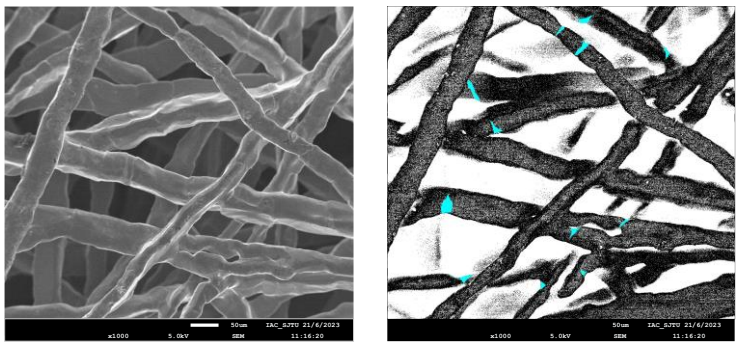


(a) I-V curves for the C1 and C15 circles

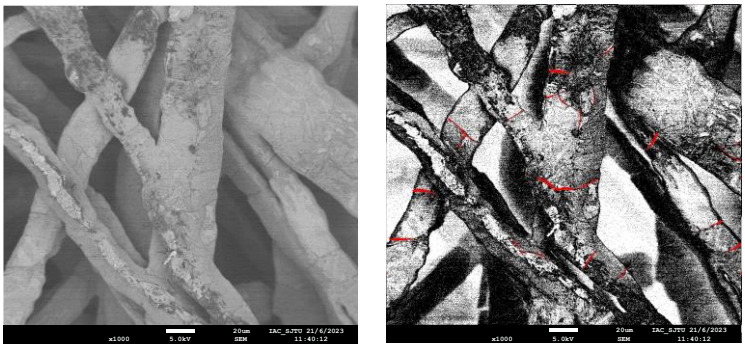


(b) EIS curve @ 0.1 A·cm^{-2} for the C1 and C15 circles

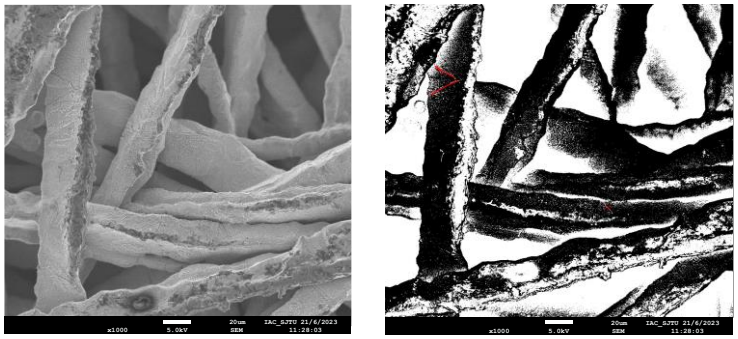
Fig. S4 Electrochemical performance of the electrolyzer with 48-15- CP PTL in 15-cycle testing



(a) SEM picture of Pristine PTL (0-0 PTL) before the I-V test. The left picture is the raw SEM picture, and in the right binary picture, the typical knuckles on the Ti fibers are marked based on ImageJ.

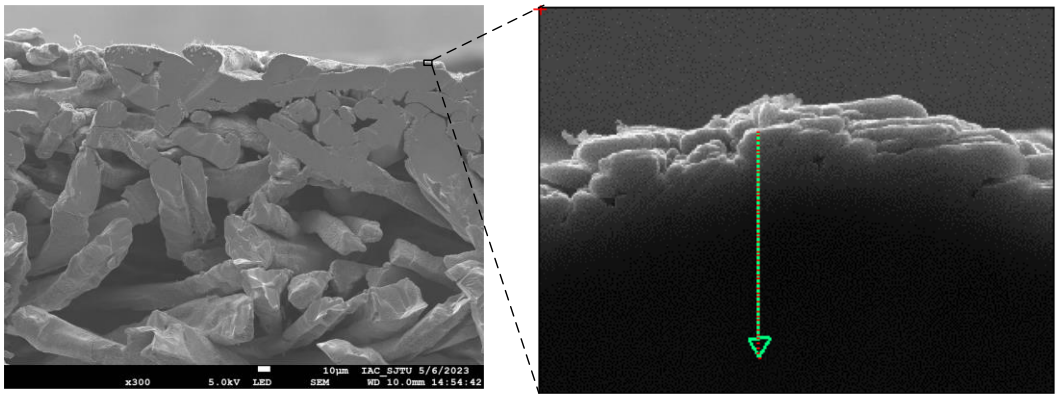


(b) SEM picture of 48-15 PTL after I-V test. The left picture is the raw SEM picture, and in the right binary picture, the typical cracks on the Ti fibers are marked based on ImageJ.

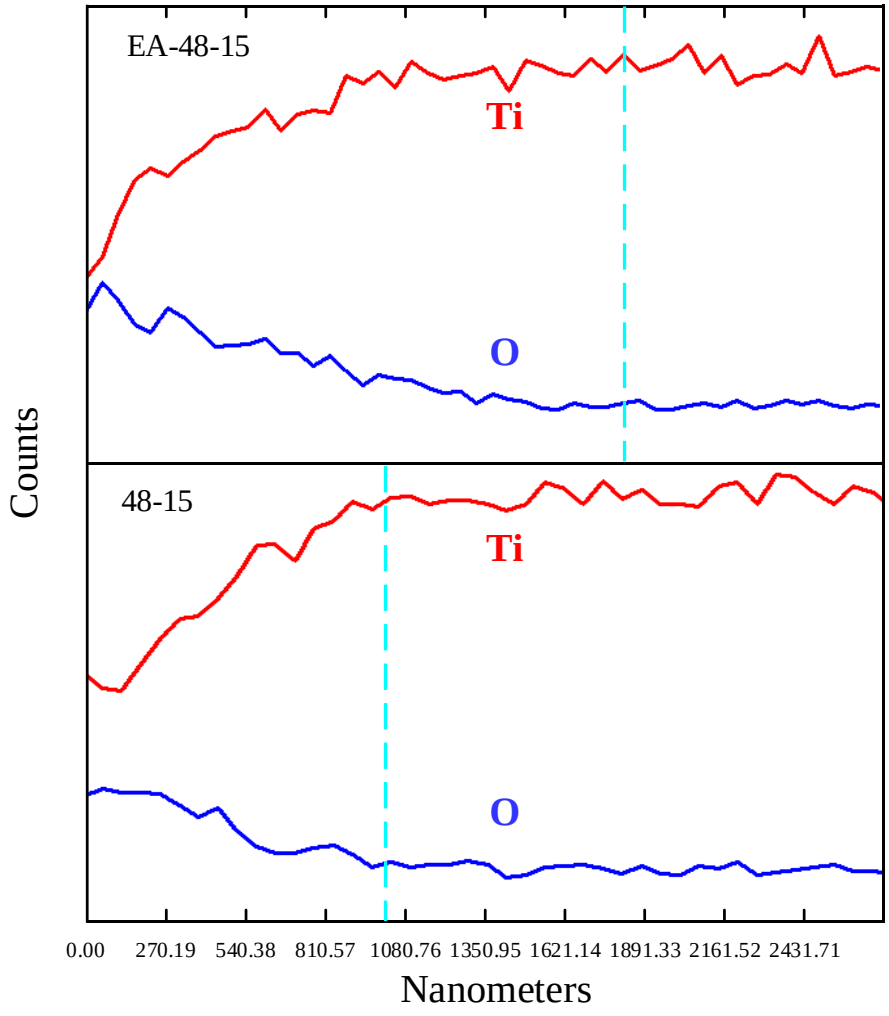


(c) SEM picture of EA-48-15 PTL after I-V test. The left picture is the raw SEM picture, and in the right binary picture, the typical cracks on the Ti fibers are marked based on ImageJ, the number of which is much smaller than those shown in Fig. S4(b).

Fig. S5 SEM figure of three Ti PTLs in three different states.



(a) (b)



(c)

Fig. S6 (a) The SEM picture for the cross-section of a Ti PTL; (b) The enlarged SEM picture based on (a) to show the top part of the cross-section of the fiber near the surface of the PTL, and the green arrow shows the direction and depth of EDS line sweep; (c) Relative contents of Ti and O elements for EA-48-15 PTL and 48-15 PTL from EDS line sweep based on the green arrow shown in (b).

Table S1 Atomic ratio of Ti for different valence

Ti PTL	The atomic ratios of different Ti valence states on the Ti surfaces			
	0 [%]	2^+ [%]	3^+ [%]	4^+ [%]
0-0	5.04	4.18	15.46	75.32
0-15	12.59	16.87	25.07	45.47