Energy Materials

Supplementary Material

Design of a polymer electrolyte membrane for enhanced zinc anode stability in reversible aqueous zinc-ion batteries

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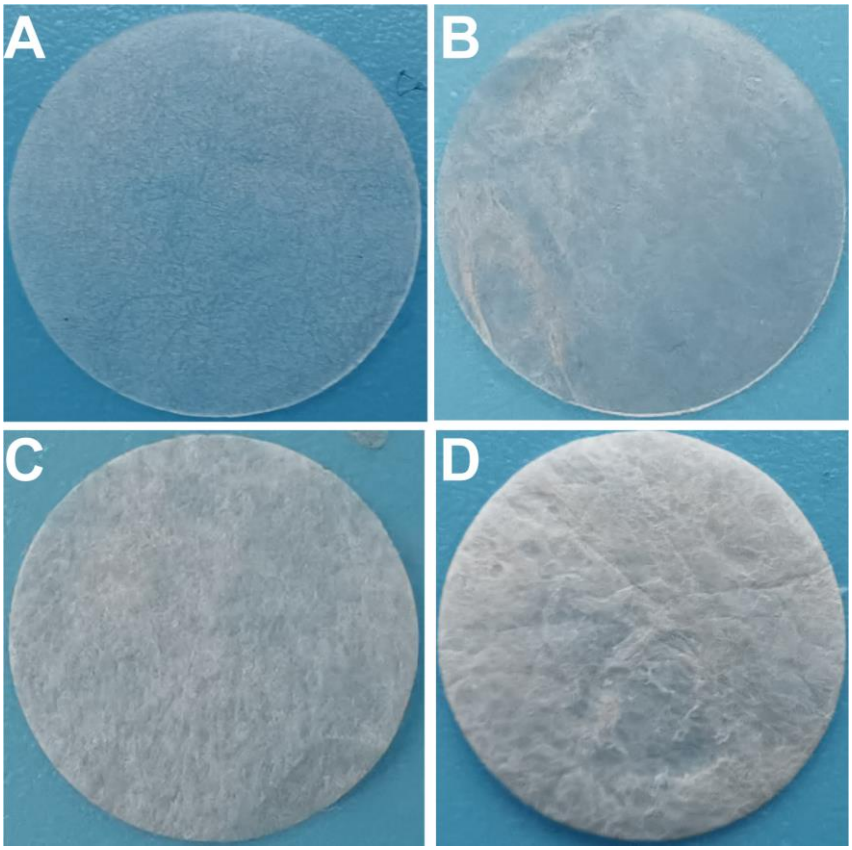

Figure 1 The optical images of the A: 0%, B: 0.5%, C: 1%, D: 3% TAC.

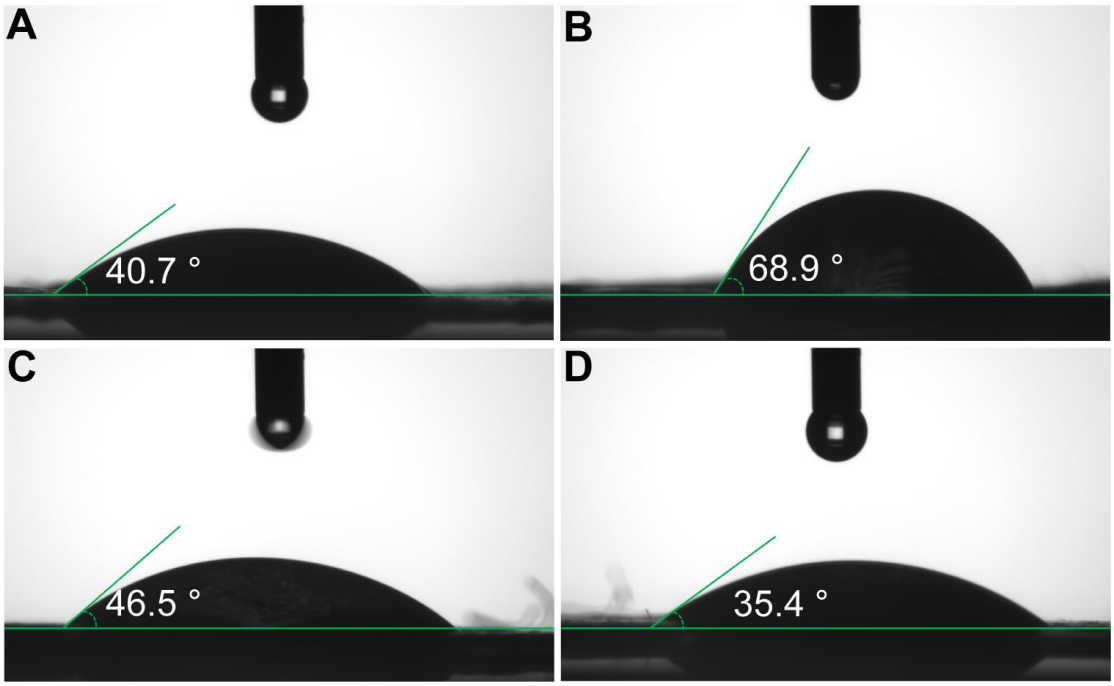

Figure 2 Optical images of water droplet on A: 0%, B: 0.5%, C: 1%, D: 3% TAC substrate.

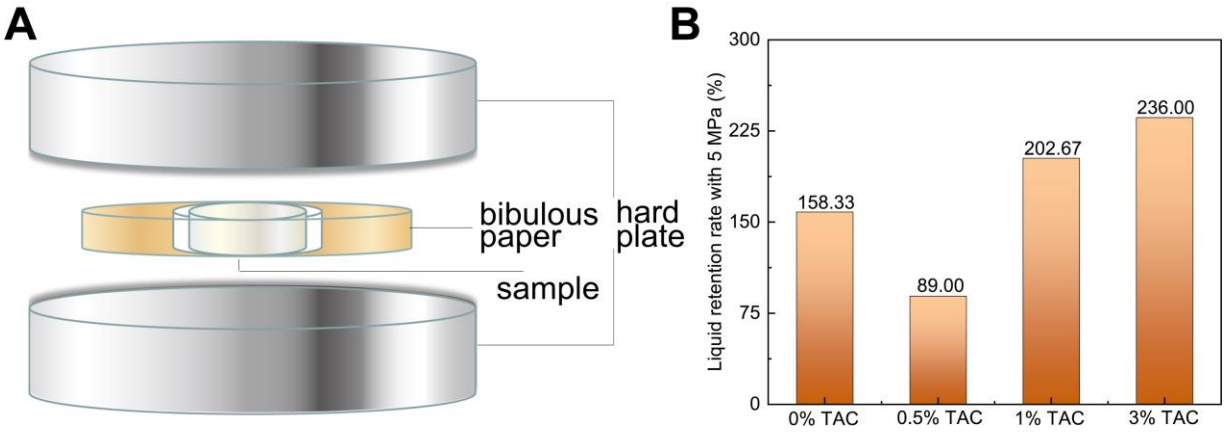

Figure 3 A: Schematic of the test device of liquid retention rates with 5 MPa; B: Liquid retention rates of 0%, 0.5%, 1%, and 3% TAC.

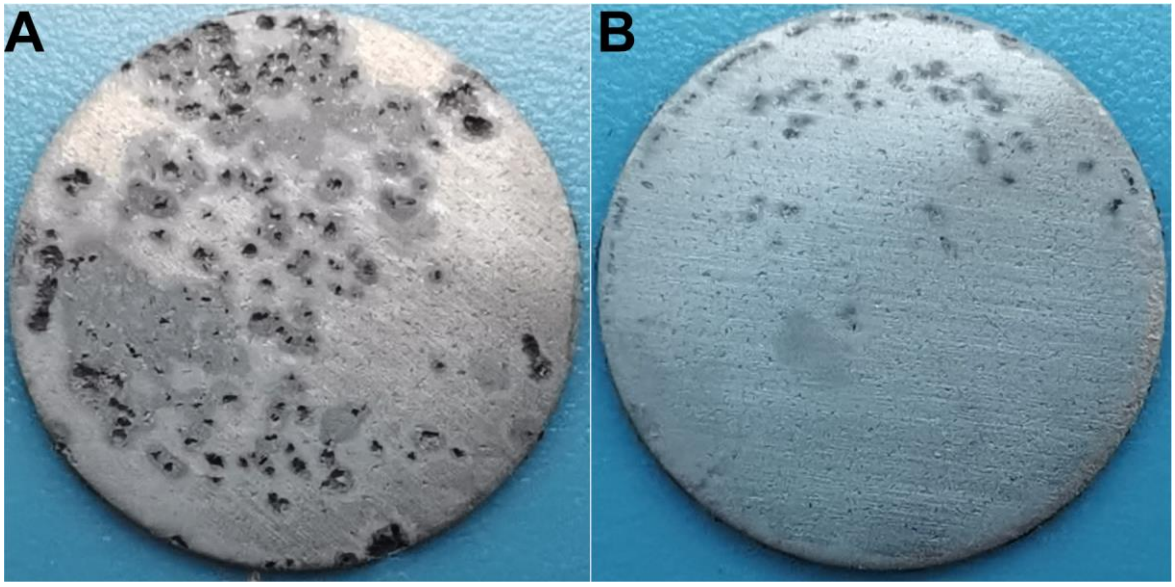

Figure 4 Images of the zinc foil reverse side under current density of 5 C at 36 h: A: 0% TAC, B: 1% TAC.

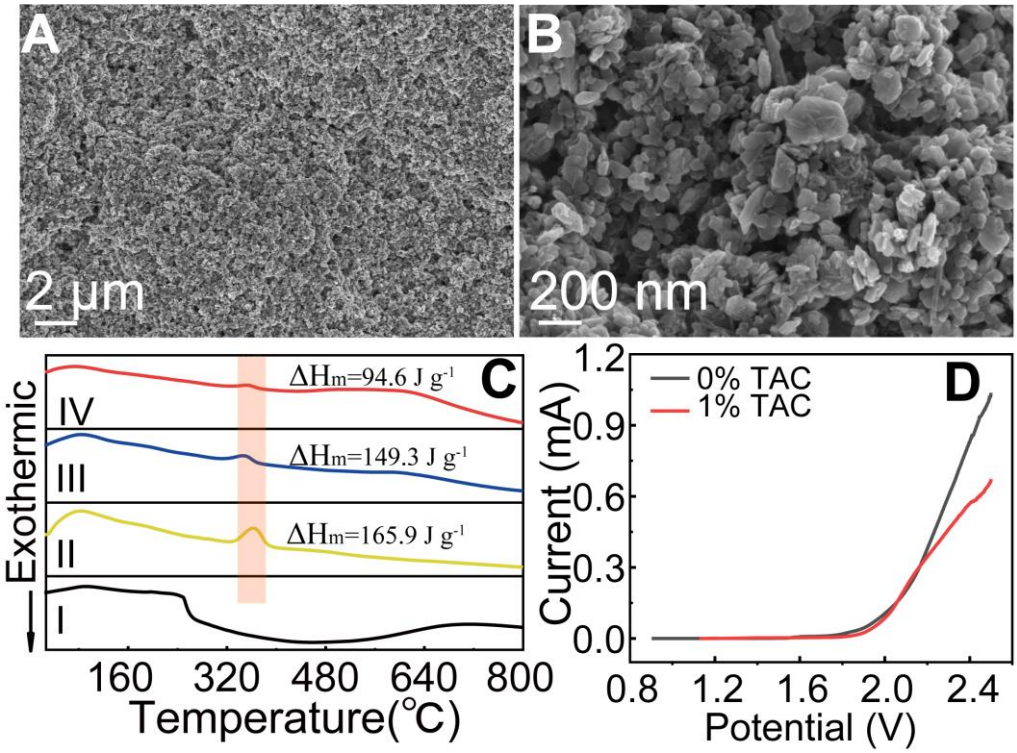

Figure 5 SEM images of A: 2 μm and B: 200 nm of CNT/MnO_2 for positive electrode; C: DSC curves of I: pristine cellulose, II: TA, III: TA+ pristine cellulose, and IV: 1% TAC collected from 30℃ to 800℃ with a heating rate of 10℃ min^{-1} at nitrogen atmosphere; D: LSV of 0% TAC and 1% TAC at scan rate of 0.1 mV s^{-1}.

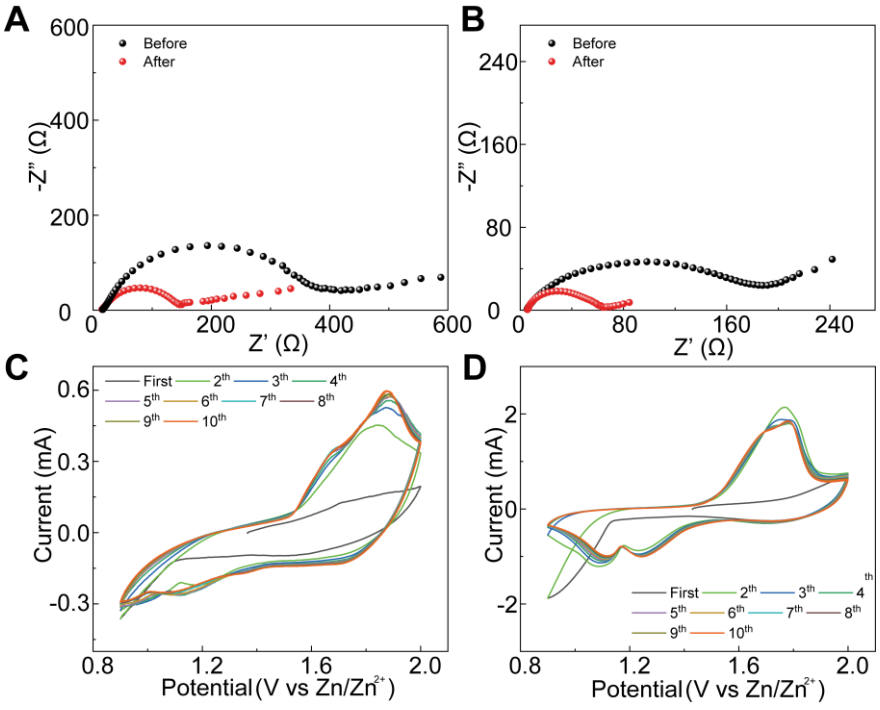

Figure 6 The EIS of A: 0%TAC and B: 1% TAC before and after 10 cycles under scan rate of 1 mV s^{-1}; CV curves of C: 0% TAC and D: 1% TAC.

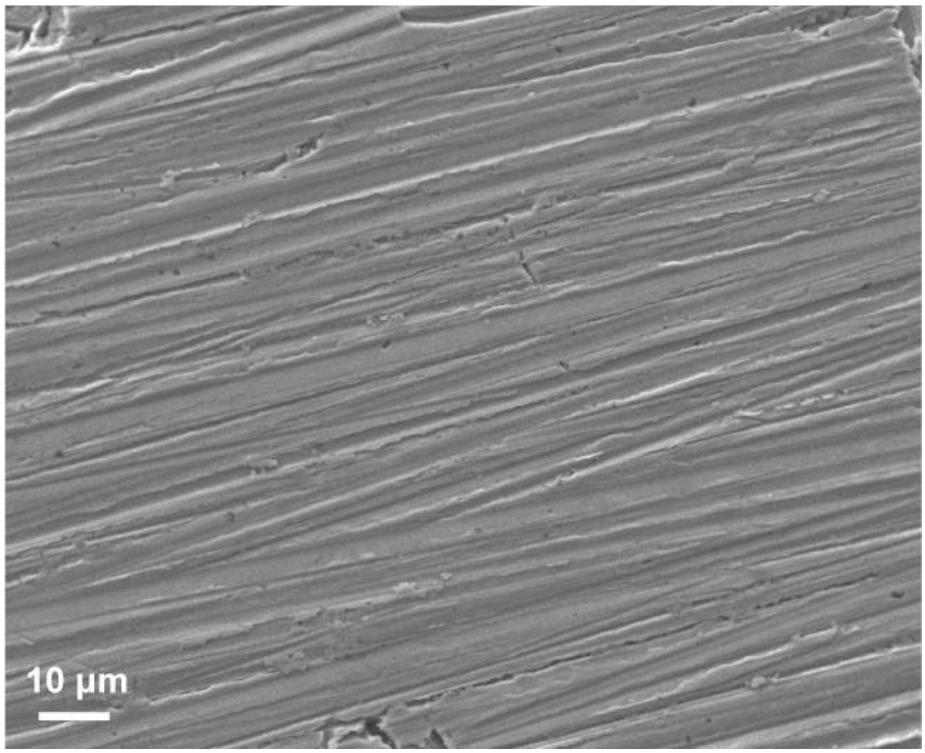

Figure 7 SEM of zinc foil by sandpaper polishing.

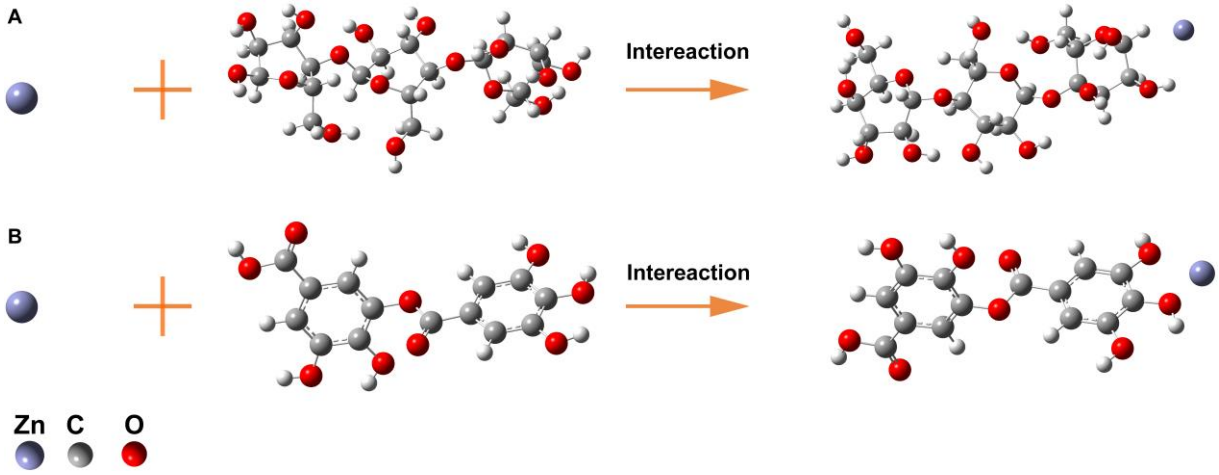

Figure 8 Schematic of the adsorption configuration between Zn^{2+} and A: 0% TAC and B: 1% TAC.

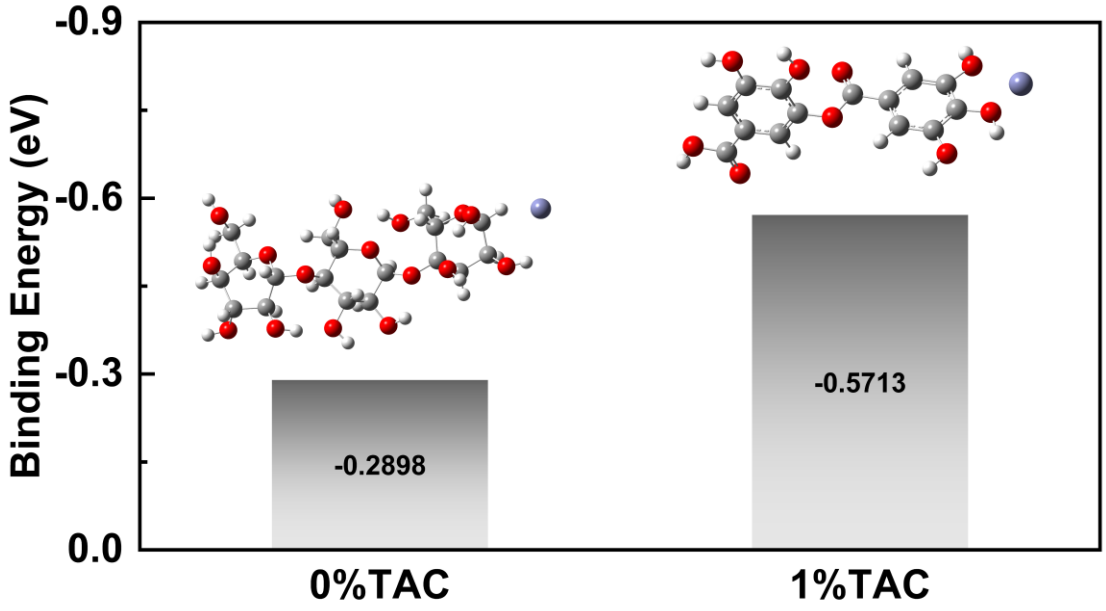

Figure 9 Calculated binding energy of 0% TAC-Zn^{2+} and 1% TAC-Zn^{2+}, with their stable system after optimization inset.

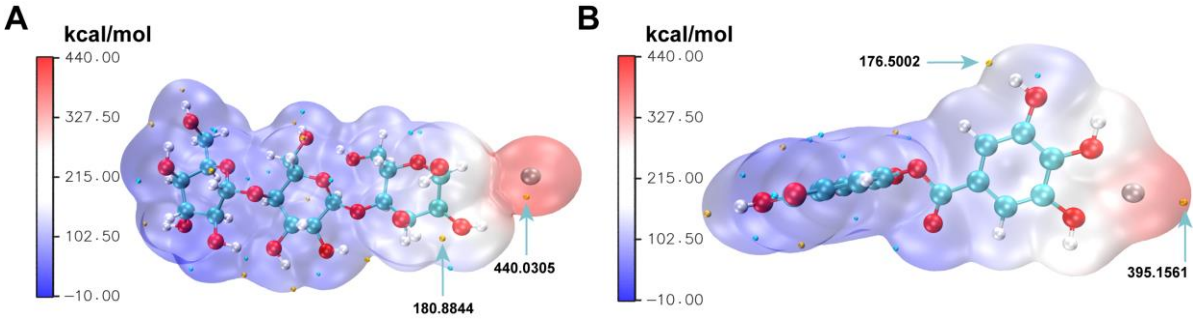

Figure 10 Electrostatic potential (ESP) distribution on the Van der Waals surface of： A: 0% TAC and B: 1% TAC coupled with Zn^{2+}.

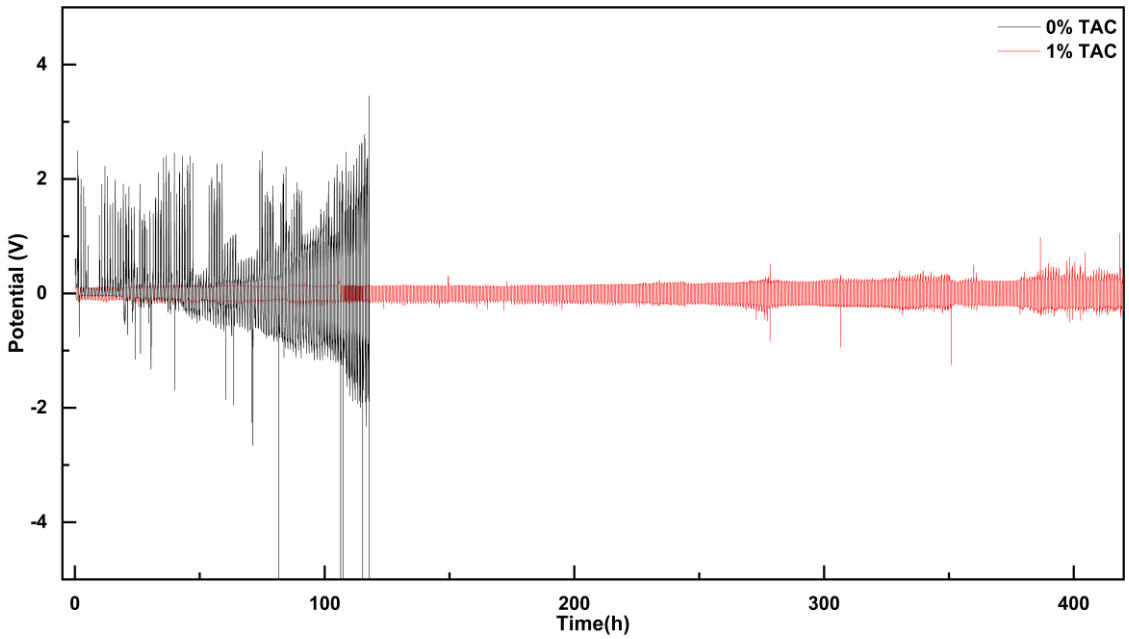

Figure 11 Galvanostatic Zn stripping and plating in a Zn||Zn cell using TAC in $ZnCl_2$ under current density of 2 mA cm^{-2} with 1 mAh cm^{-2} capacity limitation.

Table S1 Relative content of C-C/C=C, C-OH, C-O-C for TAC materials by XPS analysis.

	C-C/C=C	C-OH	C-O-C
0% TAC	8.78%	75.64%	15.58%
0.5% TAC	35.27%	59.72%	5.01%
1% TAC	34.38%	56.69%	8.93%
3% TAC	22.91%	65.15%	11.94%