

Supplementary Information

Electrodeposition of hydrated vanadium pentoxide on nanoporous carbon cloth for hybrid energy storage

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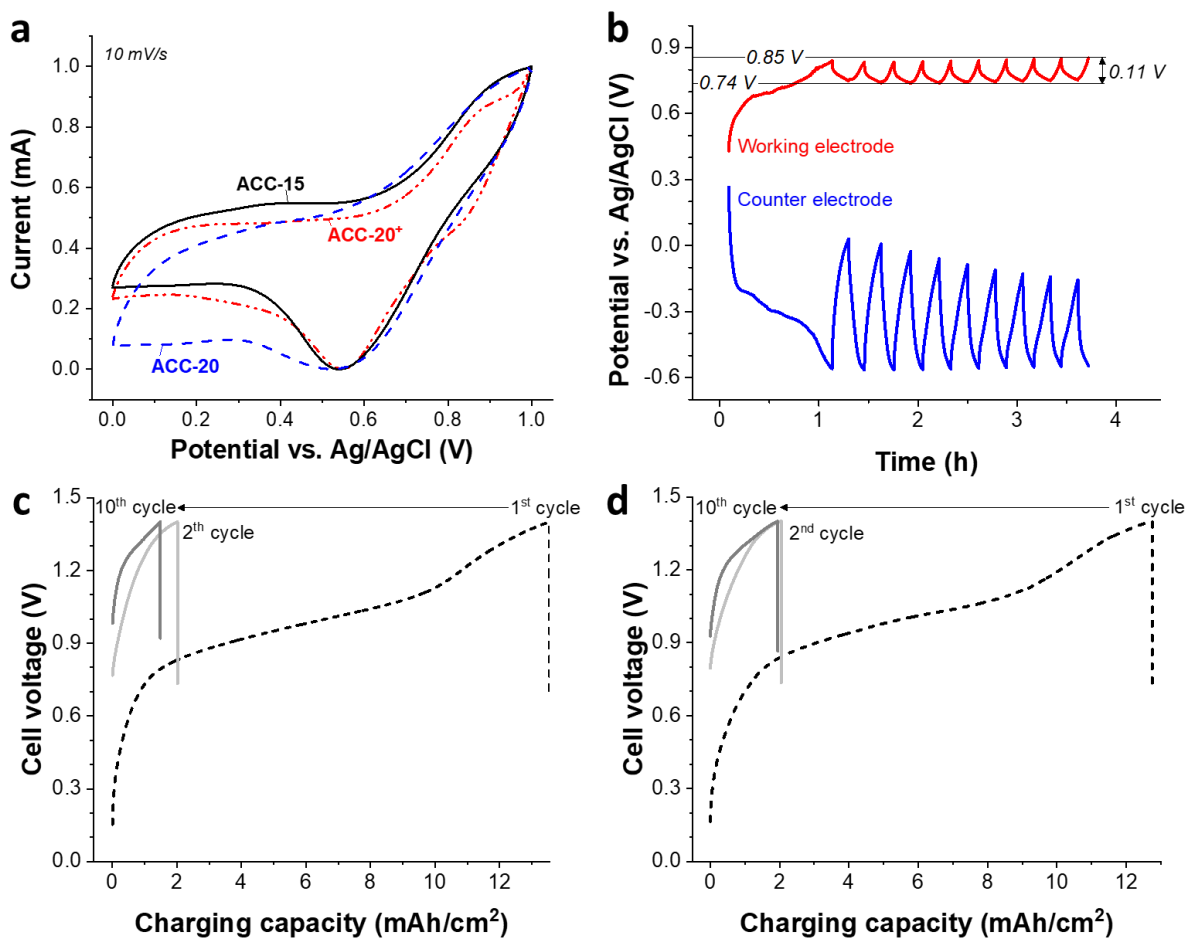


Figure S1: (a) Cyclic voltammogram of ACC electrodes in 3 M VOSO₄ aqueous solution (pH=1.8). Galvanostatic charge/discharge cycles are applied for the electrodeposition of vanadium oxides with ACC-20⁺ (b). (c) ACC-20 in 3 M VOSO₄ at 20 mA/cm² for ten cycles with a resting time of 10 min between each cycle. (d) ACC-15 in 3 M VOSO₄ at 20 mA/cm² for ten cycles with a resting time of 10 min between each cycle.

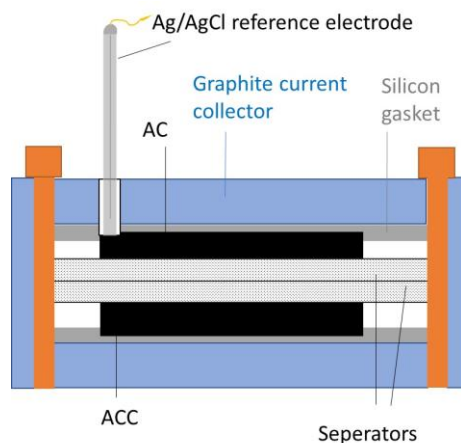


Figure S2: Schematic design of the cell used for the electrodeposition process.

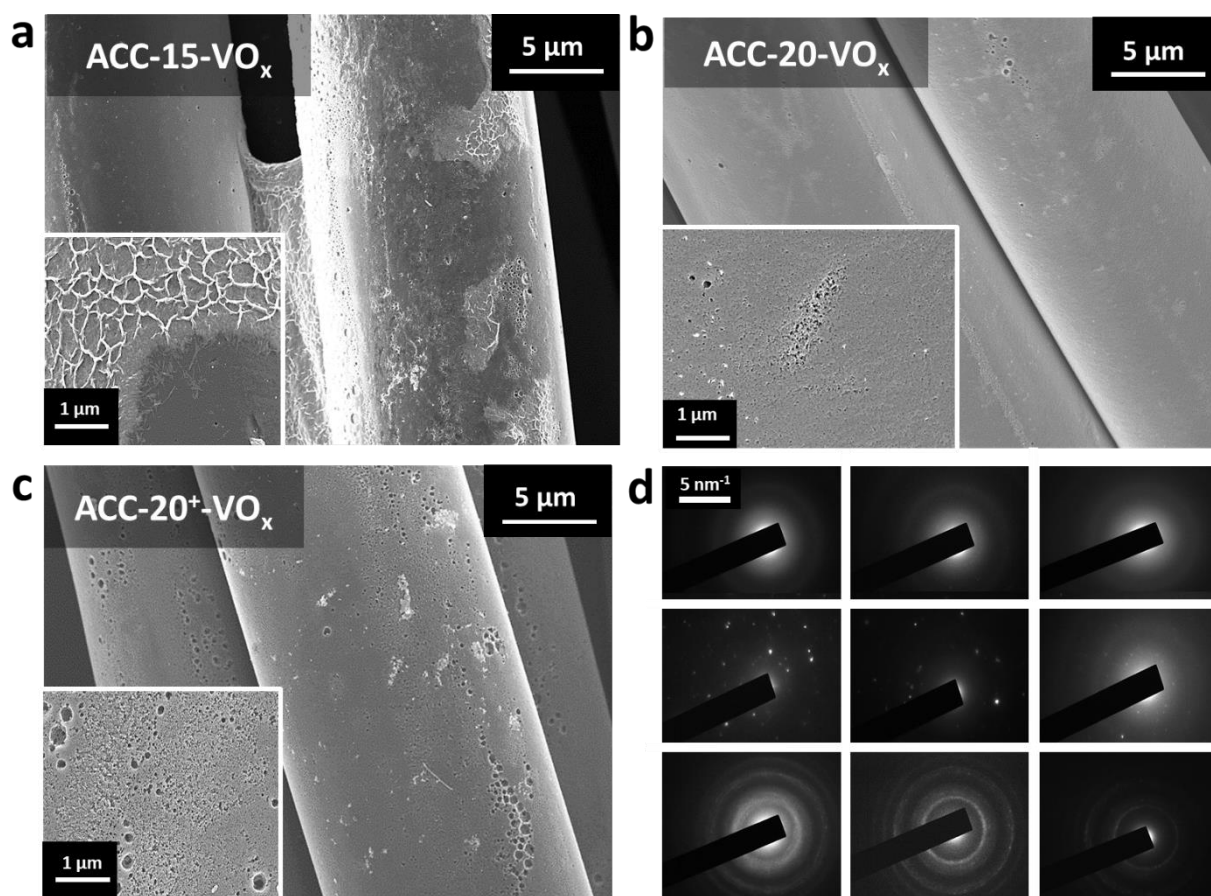


Figure S3: Scanning electron micrographs (a-c) of the electrodeposited ACC electrodes. (d) Selected area electron diffractograms of ACC-15-VO_x from nine different positions to provide a first step towards a statistical approach.

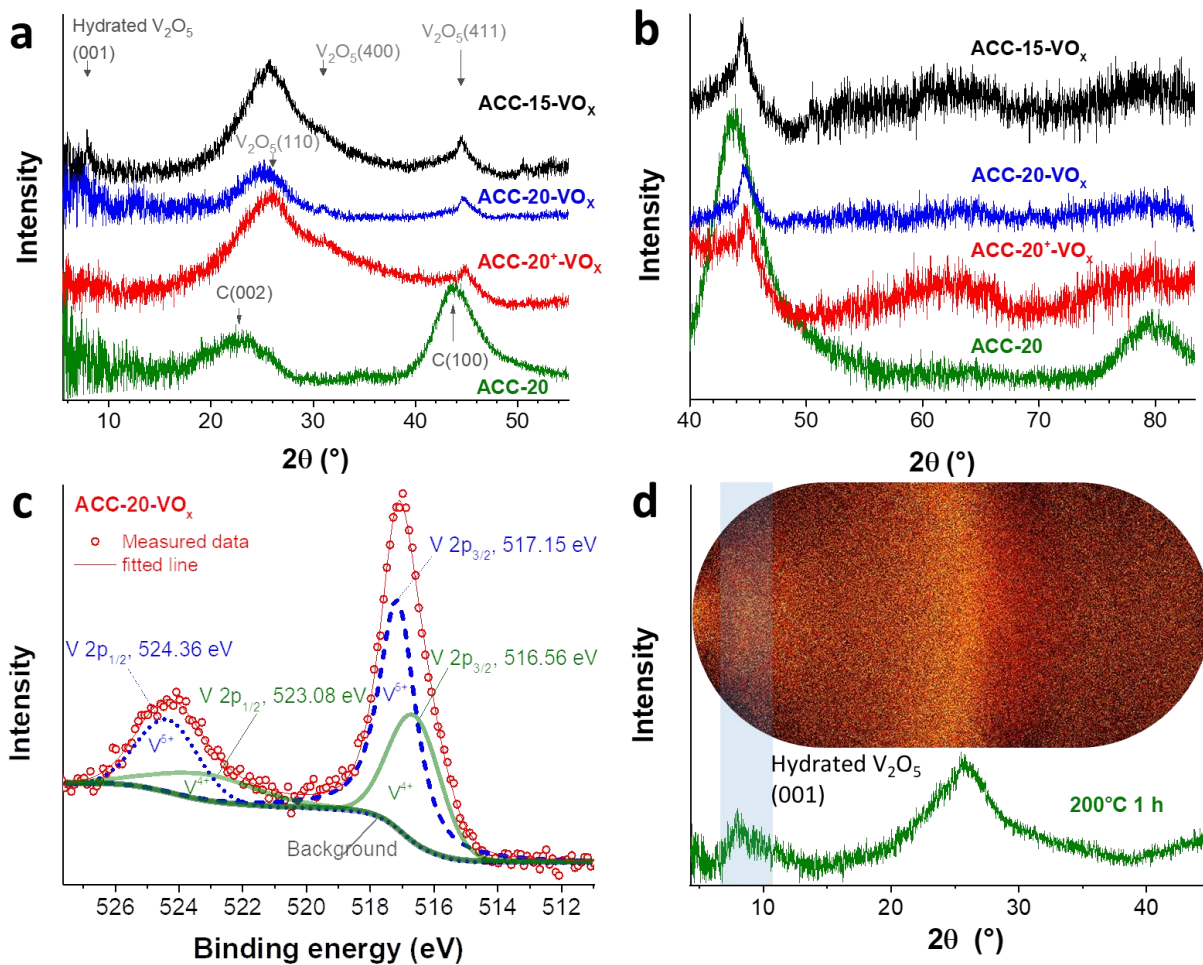


Figure S4: X-ray diffractogram of ACC-20 electrode, electrodeposited ACC electrodes (a) at 5.5-55.0° 2θ , and (b) at 40.0-83.0° 2θ , and ACC-20⁺-VO_x electrode after annealing at 200 °C for 1 h (d). The inset shows the diffraction image from the X-ray detector plate. The reflexes for vanadium pentoxide (V₂O₅) in the X-ray diffractograms are identified according to PDF 41-1426 while the reflex for hydrated V₂O₅ was identified based on Ref. ¹. (c) X-ray photoelectron spectrum of ACC-20-VO_x.

Table S1: Specific resistivity of the ACC electrodes. Data for the AC (YP-80F, Kuraray) electrode serves for comparison and was measured on a polymer binder consolidated activated carbon electrode (5 mass% PTFE).

	ACC-15	ACC-20	ACC-20 ⁺	YP-80F
Specific resistivity ($\Omega\cdot\text{cm}$)	0.25 \pm 0.01	1.35 \pm 0.05	0.9 \pm 0.1	11.5 \pm 0.5

Table S2: The parameters used for the fitting of XPS data are summarized. The parameter L/G indicates the percentage of Lorentzian relative to Gaussian shape.

Position (eV)	Assignment	FWHM (eV)	Area	L/G (%)
516.56	V2p _{3/2}	1.88	0.303	0
517.15	V2p _{3/2}	1.36	0.533	74
523.08	V2p _{1/2}	3.73	0.135	19
524.36	V2p _{1/2}	2.26	0.210	0

References:

1. Q. Wei, J. Liu, W. Feng, J. Sheng, X. Tian, L. He, Q. An and L. Mai, *Journal of Materials Chemistry A*, 2015, **3**, 8070-8075.