Supporting Information for

Study on Voltage Drop of Vanadium Nitride/Carbon Composites Derived from Pectin/VCl_3 Membrane as Supercapacitors Anode Material

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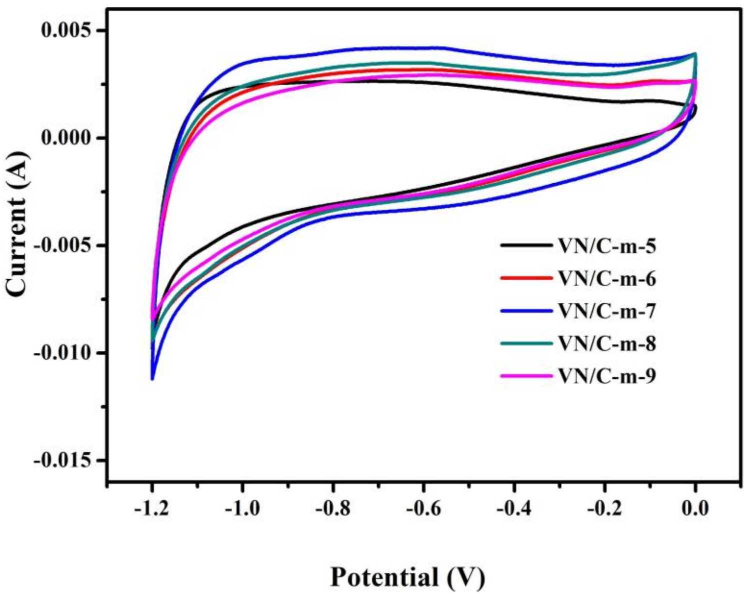

Figure S1 cyclic voltammograms (CVs) curves at the rates of 5 mV/s for VN/C-m (VN/C-m-5, VN/C-m-6, VN/C-m-7, VN/C-m-8, and VN/C-m-9

The active material here is a composite which consists of VN and active carbon. Therefore, the CV and GCD curves could show the contribution of two energy storage mechanisms. The possible reactions of VN should be the following [S1]:

VN: $V^{3+}N + 2OH^{-} + e^{-} \rightarrow V^{2+}N(OH^{-})_2$

discharge process (0V to -1.2V):

VN: $V^{2+}N(OH^{-})_2 \rightarrow V^{3+}N + 2OH^{-} + e^{-}$

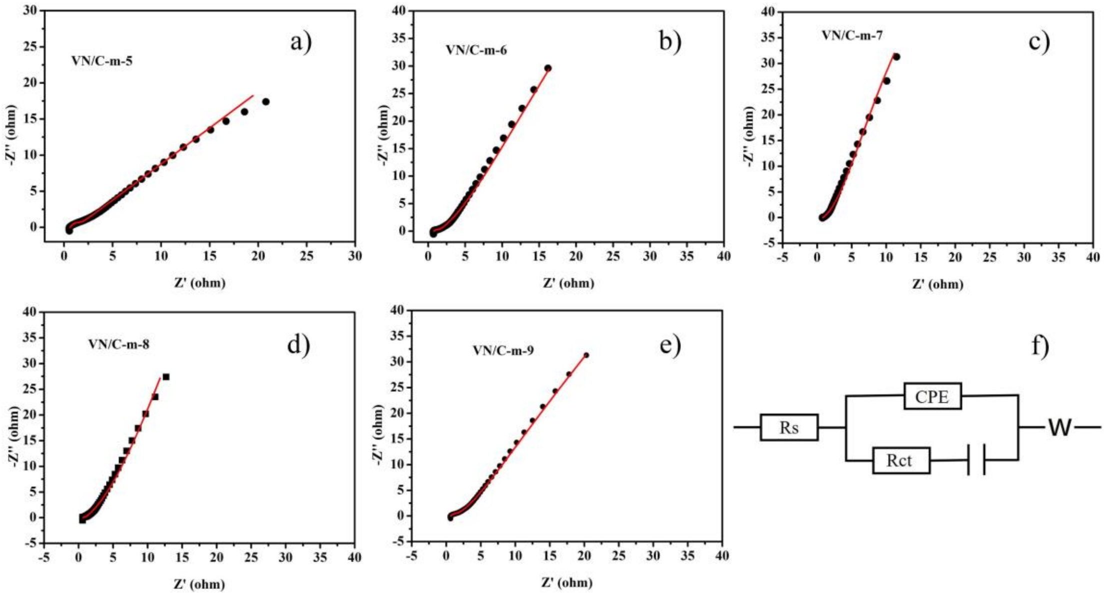

Figure S2 Fitting of Nyquist plots: (a) VN/C-m-5, (b) VN/C-m-6, (c) VN/C-m-7, (d) VN/C-m-8, (e) VN/C-m-9; and (f) circuit diagram

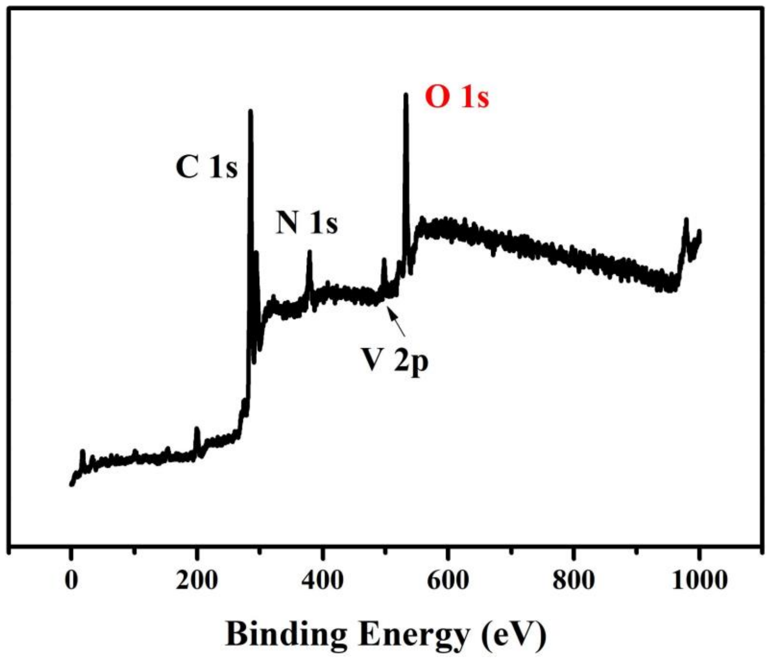

Figure S3 XPS full spectrum for VN/C-m-7.

From our analysis results and previous works [S2-S6], we can see that due to the good water retention of pectin, it eventually leads to an extremely increase in the oxygen content of the composite. And from the XPS results, this kind of oxygen is derived from chemical adsorption [S7, S8]. Much increased oxygen functional groups could be grafted into carbon surface due to the catalytic oxygen adsorption, which greatly enhances the surface polarity and thereby the wettability toward aqueous electrolyte [S9].

Table S1 Fitting value of Nyquist plots

sample	Rs	Rct	W
VN/C-m-5	0.5715	0.5824	0.1406
VN/C-m-6	0.7773	0.5237	0.1941
VN/C-m-7	0.7565	0.1931	0.3869
VN/C-m-8	0.6567	0.2196	0.2502
VN/C-m-9	0.6613	0.6196	0.1579

Table S2 Comparisons of cycle performance with other reported articles.

Materials	Electrolyte	Stability, cycle number, test current	Ref.
VN/C composite	6 M KOH	89.3 %, 2000, 1 A g^{-1}	Our work
VN-400 ℃	KOH, PH≈14	62.5 %, 1000, 50 mV s^{-1}	S10
VN-400 ℃	1 M KOH	45 %, 350, 50 mV s^{-1}	S11
VN	1 M KOH	20 %, 200, 10 mV s^{-1}	S12
V_2O_3-180 min (VN)	2 M KOH	56 %, 1000, 1A g^{-1}	S13
sputtered VN thin films	1 M KOH	78 %, 2000, 25 mV s^{-1}	S14
VN/PCNPs	2 M KOH	66 %, 1000, 1A g^{-1}	S15
VN/CNT	0.5 M Na_2SO_4	85 %, 2000, 200 mV s^{-1}	S16

Table S3 Energy dispersive spectrometer (EDS) analysis results for VN/C-m-7

Element	wt %	Atom %
C	60.35	68.43
N	3.72	3.62
O	31.42	26.75
V	4.5	1.2
Total	100	100

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