Electronic Supplementary Material (ESI) for Inorganic Chemistry Frontiers.

Supporting Information

Effect of calcination temperature on microstructure of vanadium nitride/nitrogen-doped graphene nanocomposite as an anode material in electrochemical capacitors

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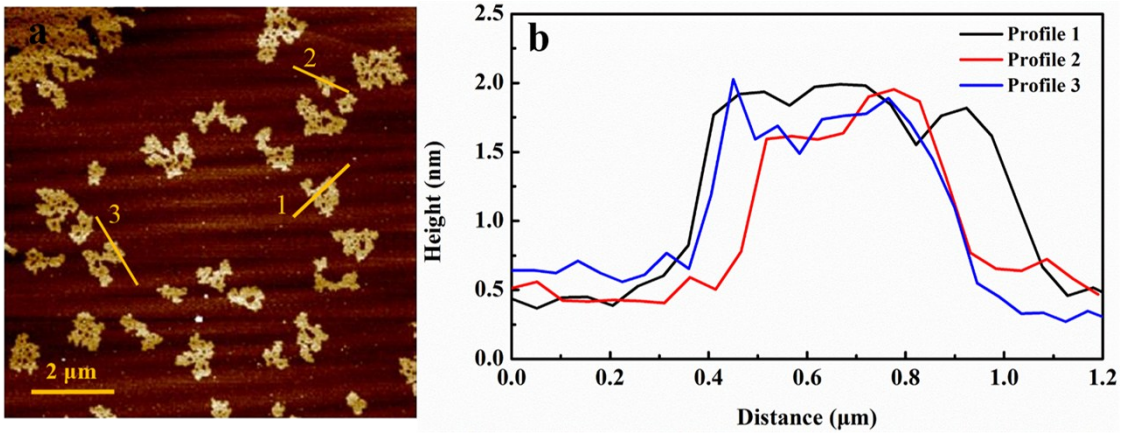

Fig. S1 (a) AFM image of N-Gr, (b) AFM height profiles of N-Gr. The position of the profiles are marked as yellow lines in (a).

AFM was used to investigate the layer thickness of N-Gr. As shown in Fig. S1, AFM image (Fig. S1a) proves the presence of layer structure of carbon nanosheets on a mica substrate. The depth profiles (Fig. S1b) demonstrate that the heights of carbon nanosheets are in the range of 1-2 nm, indicating that the carbon nanosheets can be seen as graphene with three or four layers of carbon lattice [Ref. 1-2].

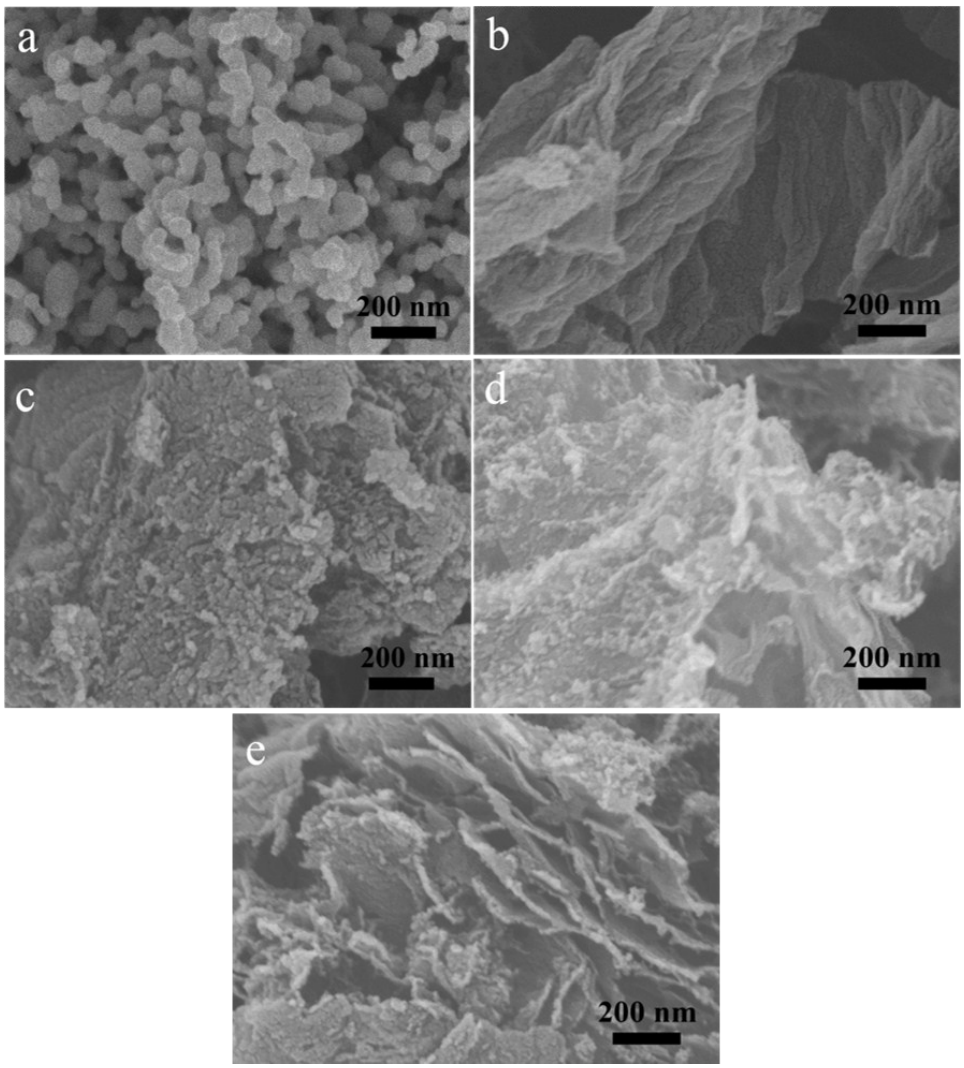

Fig. S2 SEM images of (a) VN, (b) N-Gr, (c) VN/N-Gr-700, (d) VN/N-Gr-800, (e) VN/N-Gr-900

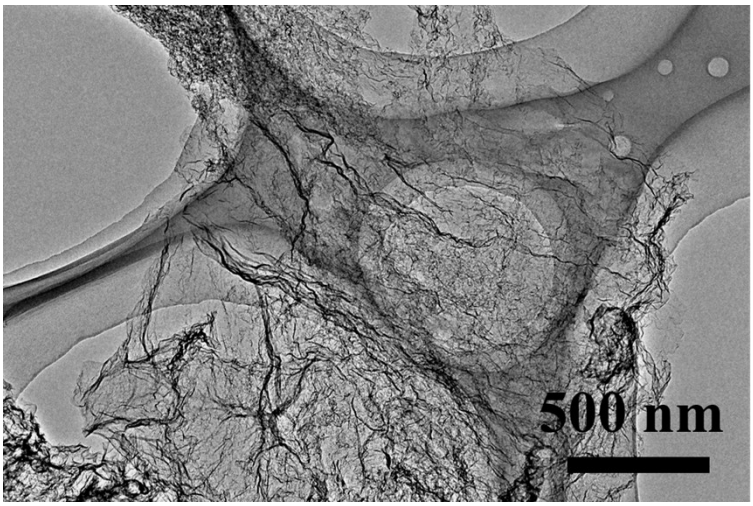

Fig. S3 TEM image of N-Gr

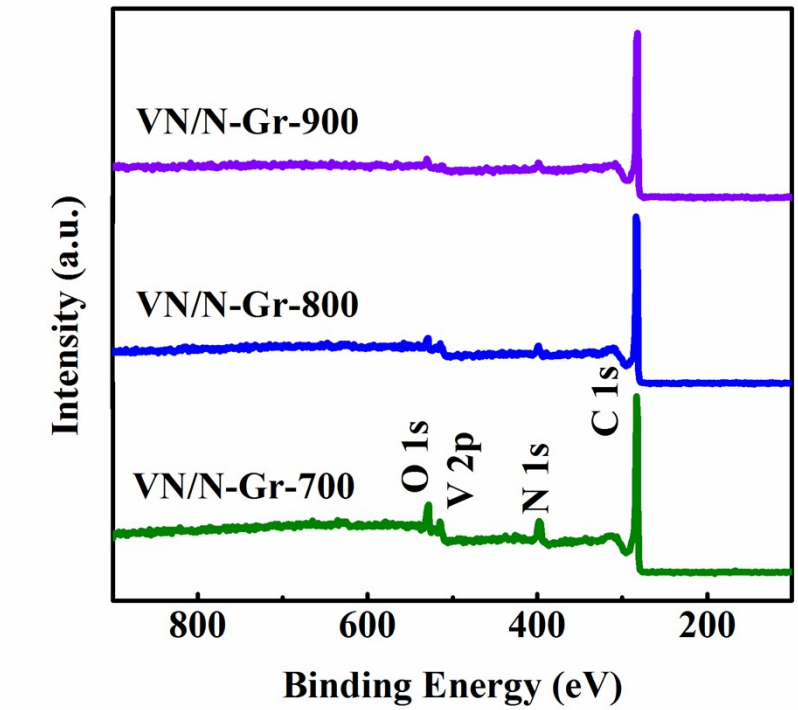

Fig. S4 XPS survey spectra of VN/N-Gr-700, VN/N-Gr-800, and VN/N-Gr-900.

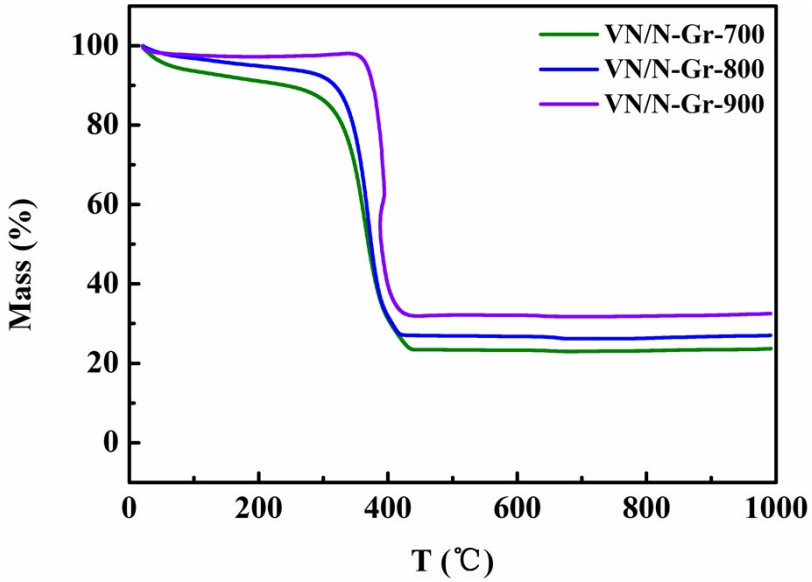

Fig. S5 TGA curves of VN/N-Gr-700, VN/N-Gr-800, and VN/N-Gr-900 in air.

The TGA curves of VN/N-Gr-700, VN/N-Gr-800, and VN/N-Gr-900 were conducted in air atmosphere from room temperature to 1000 °C with a heating rate of 5 °C min^{-1}. As shown in Fig. S5, before 300°C, all curves firstly descend due to the decomposition of oxygenous and nitrogenous groups. After that, the mass change is caused by the duplicate effect between the transformation of carbon into CO_2 and VN into V_2O_5. In the next step, the mass loss takes place owing to the combustion of carbon [Ref. 3-4]. Calculated from the TGA curves, the content of VN in VN/N-Gr-700, VN/N-Gr-800, and VN/N-Gr-900 is 16.9 wt%, 19.3 wt%, and 23.2 wt%, respectively.

Table S1 Summary of the recently reported vanadium-based/carbon hybrids and their electrochemical performances in three-electrode configurations.

Materials	Potential range (V)	Electrolytes	Capacitance
VN/C [Ref. 3]	-1.2 - 0	2 M KOH	195.7 F g^{-1} at 1 A g^{-1}
porous carbon fiber@VN [Ref. 4]	-1.1 - 0	6 M KOH	245.0 F g^{-1} at 0.5 A g^{-1}
VN/Porous Carbon [Ref. 5]	-1.15 - 0	2 M KOH	255.0 F g^{-1} at 1 A g^{-1}
VN/N-doped graphene [Ref. 6]	-1.2 - 0	6 M KOH	255 F g^{-1} at 10 mV s^{-1}
VN/porous carbon [Ref. 7]	-1.15 - 0	2 M KOH	284.0 F g^{-1} at 0.5 A g^{-1}
N-doped carbon nanosheets/VN [Ref. 8]	-1.15 - 0	2 M KOH	280.0 F g^{-1} at 1 A g^{-1}
VN/N-doped graphene [Ref. 9]	-1.2 - 0	6 M KOH	445.0 F g^{-1} at 1 A g^{-1}
VN/carbon fibre [Ref. 10]	-1.2 - 0	6 M KOH	530 F g^{-1} at 1 A g^{-1}
this work	-1.0 - 0.2	2 M KOH	342.1 F g^{-1} at 0.5 A g^{-1}

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