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Electronic Supplementary Information

In Situ Electrochemical Oxidation Strategy for Formation of the Nanogrid-

Shaped V₃O₇·H₂O with Enhanced Zinc Storage Properties

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Fig. S1 SEM images of the VO_2 precursor



Fig. S2 XRD patterns of the VO_2 precursor



Fig. S3 Transformation curve for the VO_2 precursor nanoplates



Fig. S4 Magnification 50 K for different transformation times: (a) 0 h, (b) 2 h, (c) 4 h, (d) 8 h, (e) 16 h, (f) 24 h for VO₂ precursor nanoplates



Fig. S5 Magnification 25 K for different transformation times: (a) 0 h, (b) 2 h, (c) 4 h, (d) 8 h, (e) 16 h, (f) 24 h for VO₂ precursor nanoplates



Fig. S6 Magnification 10 K for different transformation times: (a) 0 h, (b) 2 h, (c) 4 h, (d) 8 h, (e) 16 h, (f) 24 h for VO₂ precursor nanoplates



Fig. S7 The first 3 cycles of CV profiles of the initial VO₂ precursor at 0.1 mV/s in a range of 0.2-1.35 V.



Fig. S8 The rate property of the initial VO₂ precursor at different current densities $(0.1-5 \text{ A g}^{-1}).$



Fig. S9 a) The ex situ XRD patterns of the $V_3O_7 \cdot H_2O$ nanogirds at different electrochemical states in first cycles at 0.1 A g⁻¹. b-c) The ex situ Zn 2p and V 2p high-resolution XPS spectra of the $V_3O_7 \cdot H_2O$ nanogirds at fully discharged/charged states.

The ex-situ XRD and XPS data of the $V_3O_7 \cdot H_2O$ electrode are very powerfully tool to explore Zn ion insertion/extraction indeed¹⁻³. In this work, the XRD patterns present the poor crystallinity during cycle process as shown in Fig. S9a, lead to no obvious peak shift. However, when discharged to 0.7 and 0.05 V, a new peaks appeared gradually at 17.1° may resulting from the formation of a new phase. The oxidation state of V and Zn in the first discharge and charge states were determined by XPS. As shown in Fig. S9b, when discharged to 0.05 V, the main two peaks are detected in the Zn 2p region and the corresponding intensity obviously become weak in the subsequent charged state. The detection of weak Zn signal at the charged state may attribute to the surface absorption of the residual Zn from the electrolyte⁴⁻⁶. At the discharge state, a new appeared peak located at 515.1 eV corresponding to V³⁺ originated from the reduction of V⁵⁺ and V⁴⁺ due to the zinc ion intercalation. However, at the full charged state, it disappeared and the value state of the element V mainly consists of V⁵⁺ and V⁴⁺

as shown in Fig. S9c, which suggests the insertion of Zn ion during the cycles. Those results are similar with the reported results ^{6, 7}.

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