**Supplementary information for**

**Intercalation pseudocapacitance of FeVO4*·n*H2O nanowires anode for high-energy and high-power sodium-ion capacitor**

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***The calculation of H2O content in FeVO4·nH2O based on the TG result.*** When FeVO4·*n*H2O sample was heated in argon flow, the water molecular would be lost, as described in the follows.

The *n* value can be calculated by the following Equation.

Through TG test, the mass loss (Total wt.%) of FeVO4·*n*H2O is 6%.

The molecular weight is shown as follows.

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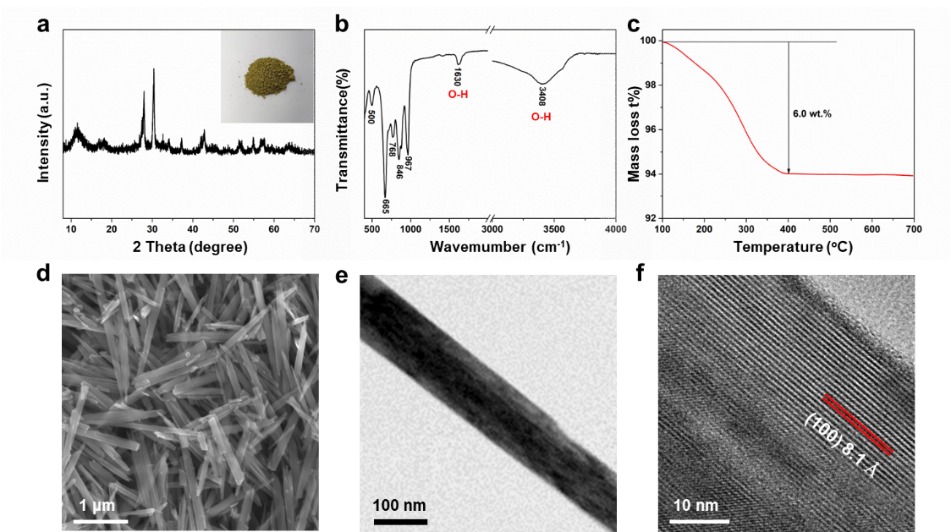
Thus, the *n* value is 0.6.

***The calculation of specific energy density and average power density***

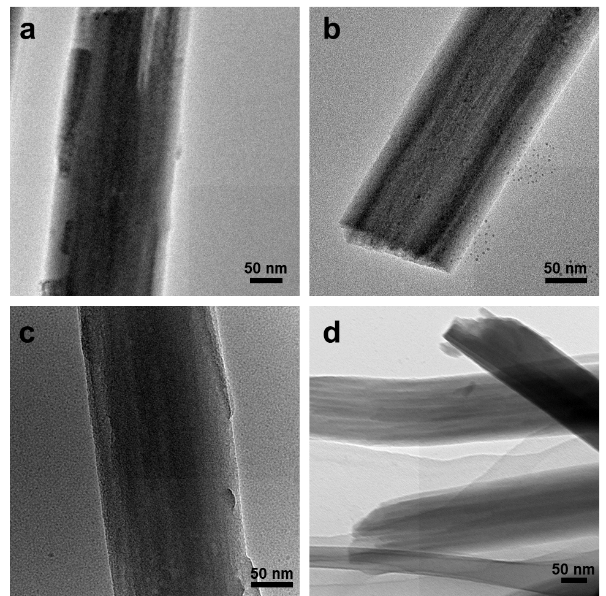
where *I* (A g−1) is the constant current density, *V* (V) is working voltage, and *t* (h) is the time of a discharge process.

***Characterization of FeVO4·nH2O nanowires***

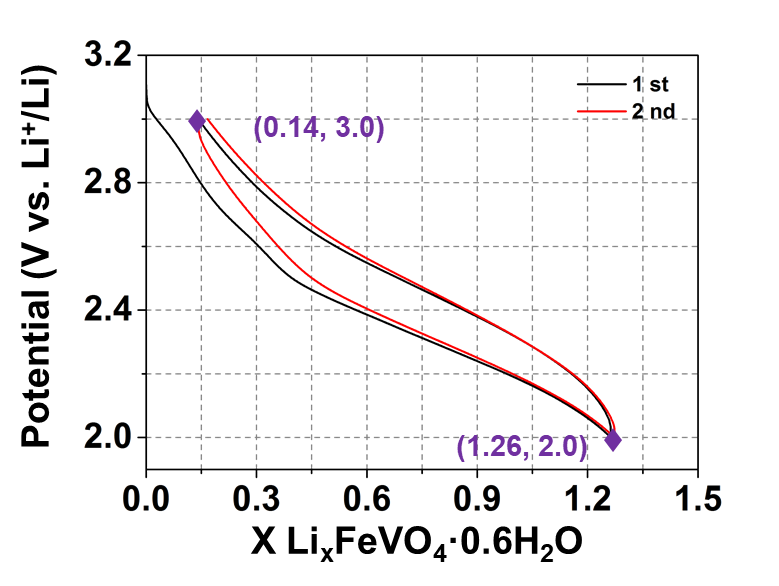
The FeVO4·*n*H2O nanowires were prepared by a facile hydrothermal method [1, 2]. The powder is in yellow (inset of Figure S1a) [1]. The powder XRD of FeVO4·*n*H2O nanowires is shown in Figure S1a. All the diffractions are indexed to Fervanite (FeVO4·*n*H2O, JCPDS card No. 27-0257) [1, 3]. Fourier transform infrared (FTIR) spectrum was further recorded to investigate the structure characteristic (Figure S1b). The absorption peaks at 500 cm-1 and 967 are respectively attributed to Fe-O and V-O stretching. The absorption bands at 665, 768, 846 cm-1 belong to bridging V—O…Fe stretching and V…O…Fe stretching modes [4, 5]. Especially, the distinct peaks at 1630 cm-1 and 3408 cm-1 are related to the stretching and bending modes of the O-H vibration, respectively, which demonstrates the existence of crystal water [6, 7]. The number of water molecules in FeVO4·*n*H2O is depicted by thermal gravity analysis (Figure S1c). The mass loss is about 6 wt.% at around 400 oC, so the value of *n* in the FeVO4·*n*H2O product is calculated to be 0.6 (the detailed calculation is shown in the Supporting Information). Based on the above results, the chemical formula of the obtained product is FeVO4·0.6H2O. The scanning electron microscope (SEM) image (Figure S1d) displays nanowire morphology of FeVO4·0.6H2O. Transmission electron microscopy (TEM) image (Figure S1e) shows the nanowire with a width of about 100 nm and a length of several micrometers. Figure S1f shows the high-resolution TEM (HRTEM) image of FeVO4·0.6H2O nanowire. The measured 8.1 Å inter distance is in agreement with (100) plane of FeVO4·0.6H2O [8].



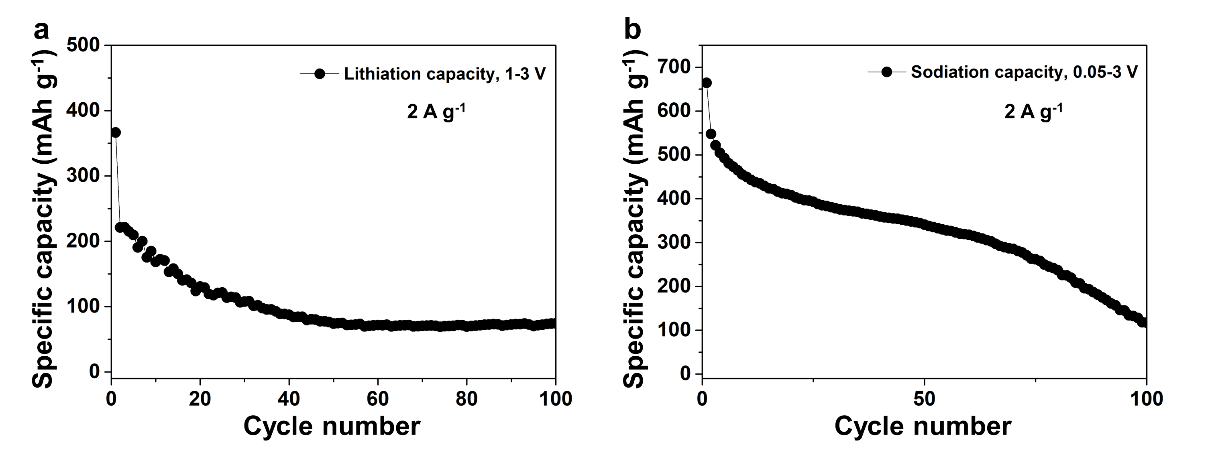
**Figure S1. Characterization of the FeVO4·0.6H2O nanowires.** (a) XRD pattern of FeVO4·0.6H2O nanowires. The yellow powder of FeVO4·0.6H2O (inset of a). FTIR spectrum (b), TG curve (c), SEM (d), TEM (e) and HRTEM (f) images of FeVO4·0.6H2O nanowires.



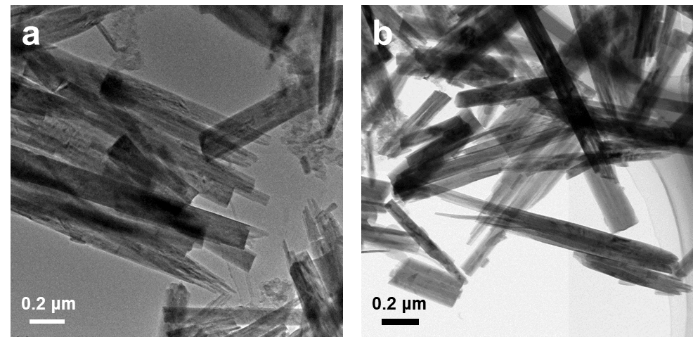
**Figure S2.** For Li+ storage in 1-3 V *vs.* Li+/Li, *ex-situ* TEM images of FeVO4·0.6H2O nanowires when discharged to 1 V *vs.* Li+/Li (a) and charged to 3 V *vs.* Li+/Li (b), respectively. For Na+ storage in 0.05-3 V *vs.* Na+/Na, *ex-situ* TEM images of FeVO4·0.6H2O nanowires when discharged to 0.05 V *vs.* Na+/Na (c) and charged to 3 V *vs.* Na+/Na (d), respectively.



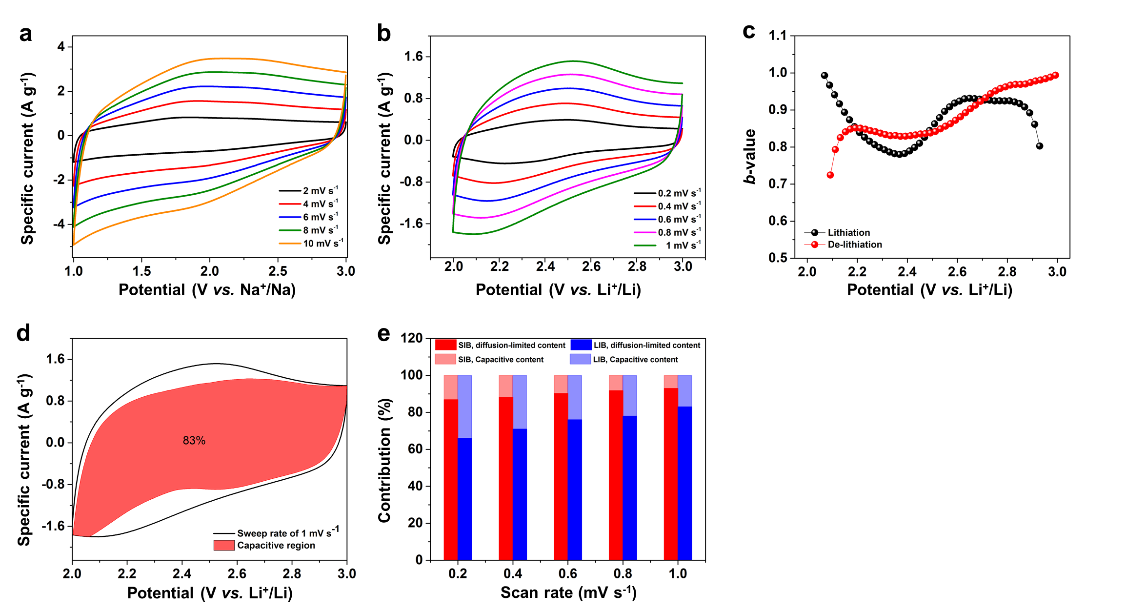
**Figure S3.** For Li + storage in 2-3 V *vs.* Li+/Li, potential *vs.* composition profiles of FeVO4·0.6H2O nanowires.



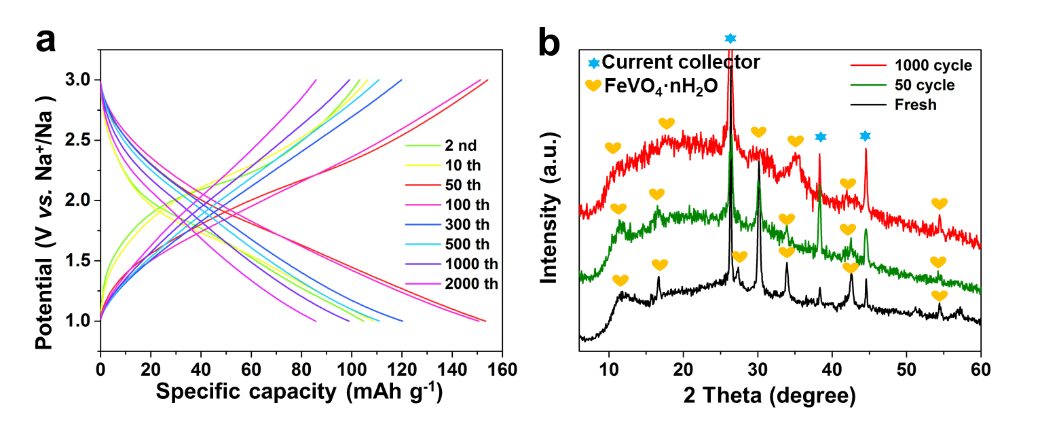
**Figure S4.** The cycling performance undergoing deep lithiation or sodiation at 2 A g-1 of the FeVO4·0.6H2O nanowires for Li+ (a) and Na+ (b) storage.

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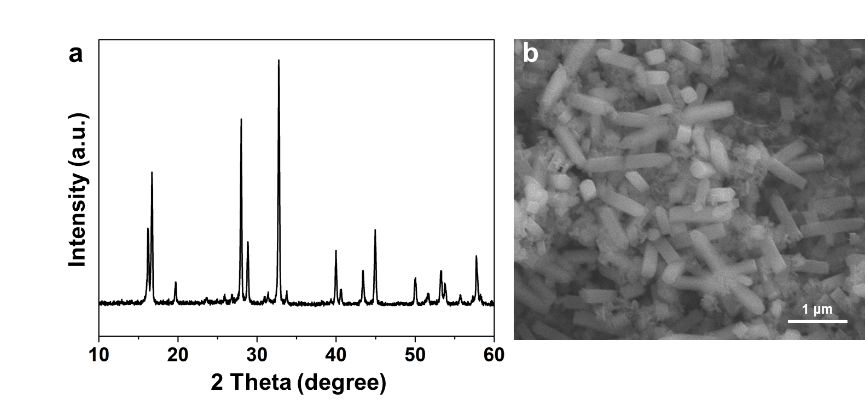
**Figure S5.** For Na+ storage in 1-3 V *vs.* Na+/Na, *ex-situ* TEM images of FeVO4·0.6H2O nanowires when discharged to 1 V *vs.* Na+/Na (a) and charged to 3 V *vs.* Na+/Na, respectively (b).

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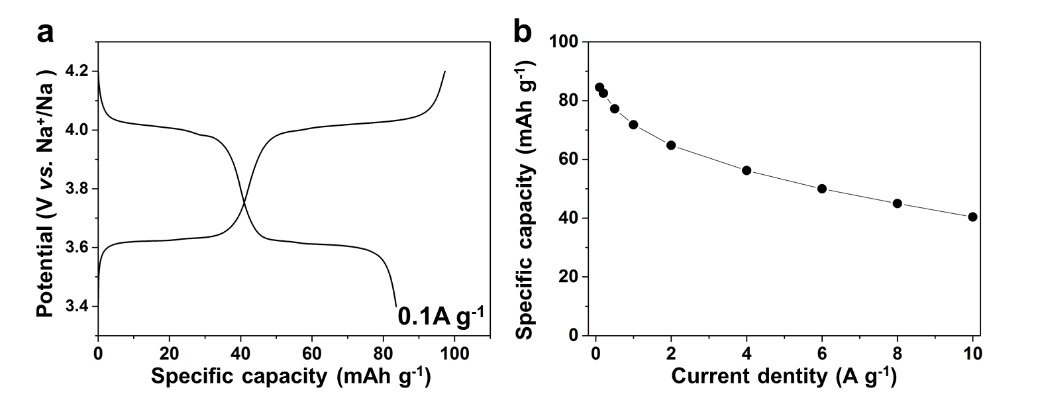
**Figure S6.** (a) CV curves of FeVO4·0.6H2O nanowires in 1-3 V *vs.* Na+/Na at different sweep rates from 2 to 10 mV s-1. (b) CV curves of FeVO4·0.6H2O nanowires in 2-3 V vs. Li+/Li at different sweep rates from 0.2 to 1 mV s-1. (c) Analysis of *b*-value at different potential for Li+ storage. (d) For Li+ storage, the separation of the capacitive and diffusion at a sweep rate of 1 mV s-1. (e) The contribution ratio of the capacitive and diffusion-controlled charge versus sweep rates for Li+ and Na+ storage.

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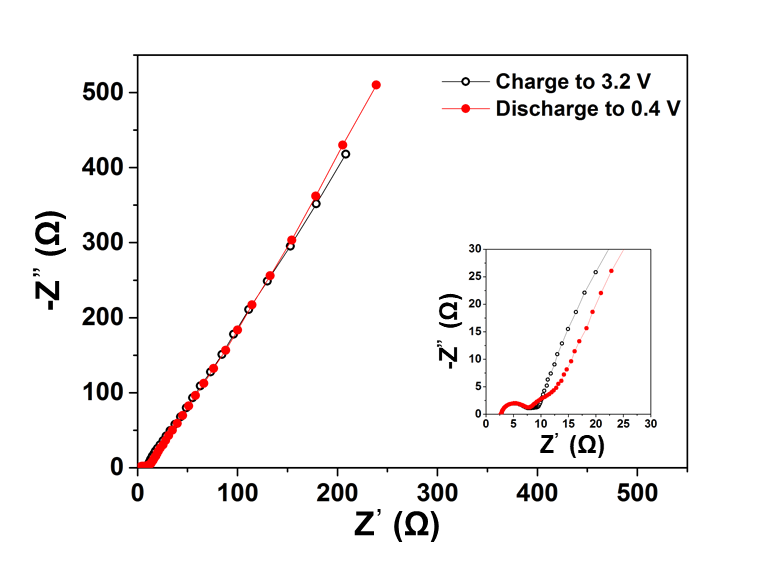
**Figure S7.** The charge-discharge profiles (a) and *ex-situ* XRD patterns (b) of different cycles at 2 A g-1 in 1-3 V *vs*. Na+/Na.

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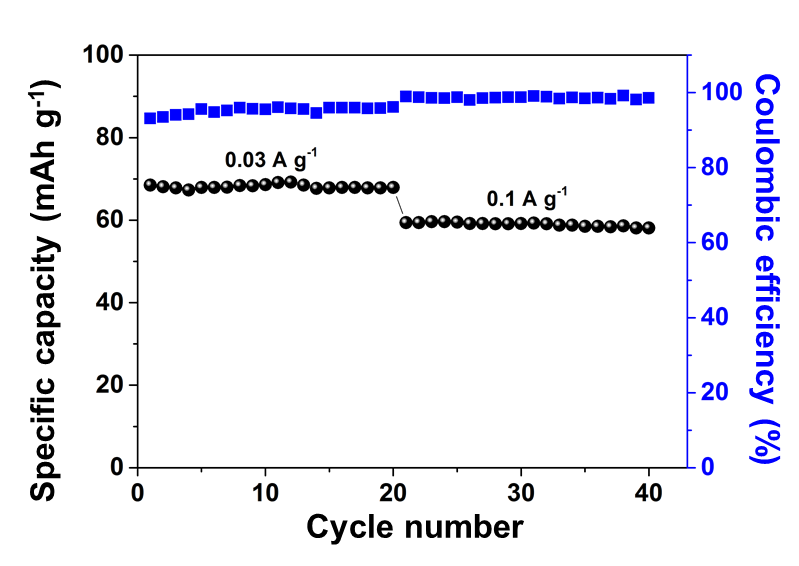
**Figure S8.** XRD pattern (a) and SEM image (b) of NVOPF/rGO.



**Figure S9.** (a) Charge-discharge curves of NVOPF/rGO at 0.1A g-1 in 3.4-4.2 V *vs.* Na+/Na. (b) Rate capability of NVOPF/rGO cathode.



**Figure S10.** The EIS spectra of SIC at charge state and discharge state.



**Figure S11.** The activation process of SIC at small current density before cycling at 2 A g-1.

References

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