

Supporting Information

Copper vanadates/polyaniline composites as anode material for lithium-ion batteries

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Figure S1 displays the infrared diffuse reflectance spectra of pure $\text{Cu}_5(\text{VO}_4)_2(\text{OH})_4 \cdot \text{H}_2\text{O}$ nanorods and $\text{Cu}_5(\text{VO}_4)_2(\text{OH})_4 \cdot \text{H}_2\text{O}/\text{PANI}$ nanocomposite. For pure $\text{Cu}_5(\text{VO}_4)_2(\text{OH})_4 \cdot \text{H}_2\text{O}$ nanorods, the characteristic peaks are mainly in the range from 500 cm^{-1} to 1000 cm^{-1} , including the symmetric and asymmetric stretching vibration peaks of the V–O band and the stretching vibration mode of the V=O band. The strong characteristic peak at 3331 and 1749 cm^{-1} can be assigned to the symmetric stretching vibration and bending vibration of H–O–H in H_2O molecules, respectively. The weak at 1552 cm^{-1} is the vibration of Cu–O bond. All these peaks can also be observed in $\text{Cu}_5(\text{VO}_4)_2(\text{OH})_4 \cdot \text{H}_2\text{O}/\text{PANI}$ nanocomposite. In this composite, the peaks at 1558 cm^{-1} and 1490 cm^{-1} are attributed to the C=C stretching of quinonoid rings and C=C stretching of benzenoid rings, respectively. The peak at 1269 cm^{-1} corresponds to C–N stretching vibration. The peak at 1146 cm^{-1} is attributed to the characteristic of the C–N=C bond stretching. The band at 1037 cm^{-1} can be designated as the split peak of C–H plane bending vibration, indicating the strong interaction between the organic shell and inorganic core.

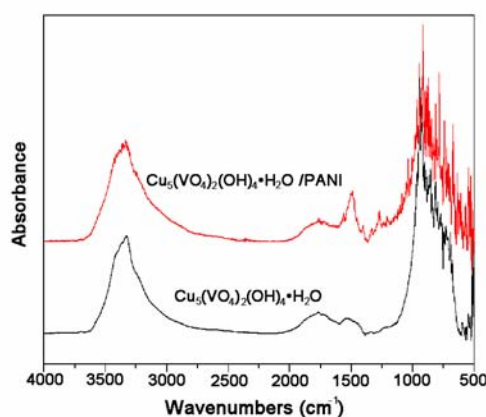


Figure S1. The infrared diffuse reflectance spectra of $\text{Cu}_5(\text{VO}_4)_2(\text{OH})_4 \cdot \text{H}_2\text{O}$ and $\text{Cu}_5(\text{VO}_4)_2(\text{OH})_4 \cdot \text{H}_2\text{O}/\text{PANI}$ nanorods.

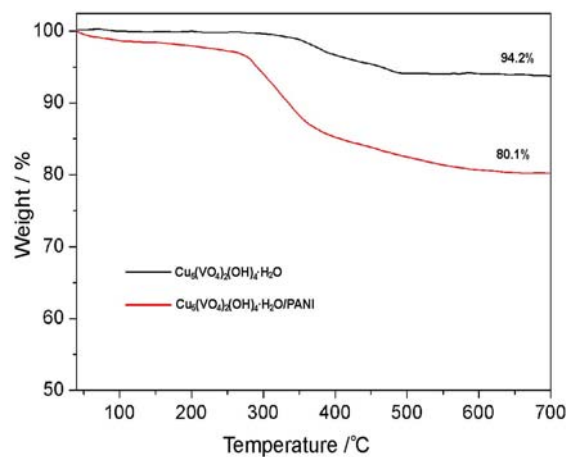


Figure S2. Thermal gravimetric analysis (TGA) curves of the $\text{Cu}_5(\text{VO}_4)_2(\text{OH})_4 \cdot \text{H}_2\text{O}$ and $\text{Cu}_5(\text{VO}_4)_2(\text{OH})_4 \cdot \text{H}_2\text{O}/\text{PANI}$ composite obtained from 40 to 700 °C at a heating rate of 20 °C/min.

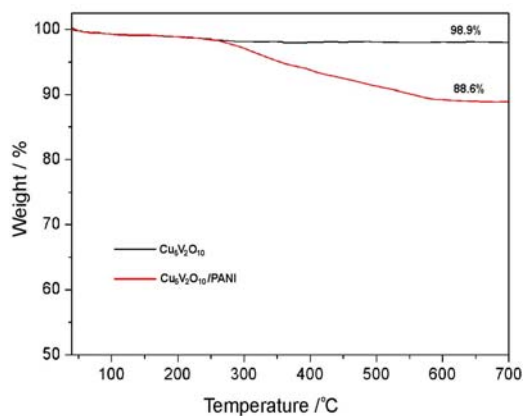


Figure S3. TGA curves of the $\text{Cu}_5\text{V}_2\text{O}_{10}$ and $\text{Cu}_5\text{V}_2\text{O}_{10}/\text{PANI}$ composite obtained from 40 to 700 °C at a heating rate of 20 °C/min.

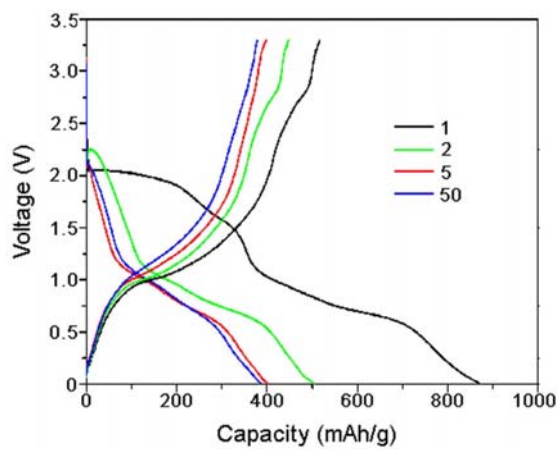


Figure S4. The discharge-charge profiles of pure $\text{Cu}_5(\text{VO}_4)_2(\text{OH})_4 \cdot \text{H}_2\text{O}$ at a current density of 150 mA g^{-1} between 0.01 V and 3.3 V.

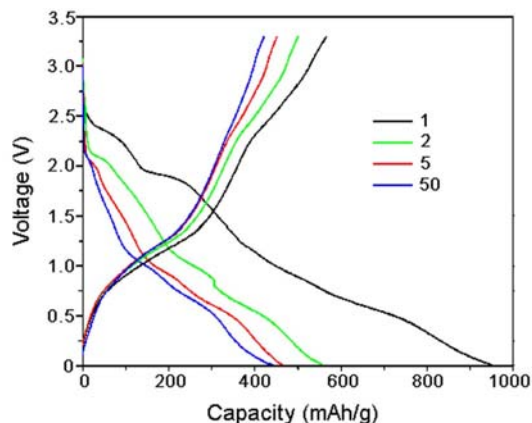


Figure S5. The discharge–charge profiles of pure $\text{Cu}_5\text{V}_2\text{O}_{10}$ at a current density of 150 mA g^{-1} between 0.01 V and 3.3 V.

Figure S6 displays the FESEM and TEM images of the electrode mixture removed from the $\text{Cu}_5(\text{VO}_4)_2(\text{OH})_4 \cdot \text{H}_2\text{O}/\text{PANI}$ electrode after 50 discharge–charge cycles. The FESEM images are not quite clear because of the presence of conductive carbon black and PVDF binder in the electrode mixture; however, the specific rod structure can be identified after 50 discharge–charge cycles, indicating that the primary 1D rodlike morphology of $\text{Cu}_5(\text{VO}_4)_2(\text{OH})_4 \cdot \text{H}_2\text{O}/\text{PANI}$ nanostructures can still be preserved during the lithium intercalation/deintercalation process, which is of great significance for holding the capacity of the batteries.

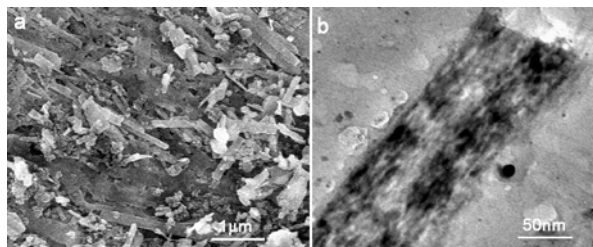


Figure S6. FESEM (a) and TEM (b) images of the electrode mixture removed from the $\text{Cu}_5(\text{VO}_4)_2(\text{OH})_4 \cdot \text{H}_2\text{O}/\text{PANI}$ electrode after 50 discharge–charge cycles.