Supporting Information

for

Influence of Current Collector Materials on the Electrochemical Performance of Aqueous Zinc-Ion Batteries

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Supplementary Results

Figure S1a and **b** displays SEM images of VO_2 (B) nanorods fabricated via hydrothermal synthesis, at different magnifications. Flaky VO_2 (B) rods can be seen in **Figure S1a** clustered together, which is further highlighted in **Figure S1b** as at the higher magnification you can see the individual nanorods within the cluster.

A Raman spectrum of the material was obtained (**Figure S1c**), from which all the expected Raman peaks were visible.[1,2] The peaks at 140.9 cm^{-1} and 190.8 cm^{-1} correspond to the layered lattice structure. The peaks at 281.5 cm^{-1} and 405.8 cm^{-1} are attributed to V=O bending vibrations, while the 688.5 cm^{-1} peak arises from the V–O–V stretching mode associated with corner-shared oxygens of two pyramids. The 990.6 cm^{-1} peak is assigned to the stretching vibration of the terminal V=O bond.[1]

X-ray diffraction measurements were taken to further ensure the correct material has been synthesised. The XRD spectra (**Figure S1d**) for the VO_2 (B) nanorods produced the expected peaks, with the corresponding planes indicated, when compared to the MDI Jade XRD data base. The characteristic peaks for VO_2 (B) are observed at 2θ = 14.4°, 15.4°, 25.4°, 29.0°, 30.2°, 44.2°, 45.1°, and 49.5°, corresponding to the (001), (200), (110), (002), (–401), (003), (–601), and (020) Miller indices, respectively.[3] These are the strong peaks, with every peak intensity being above 5, which coupled with the presence of the two peaks at 14° and 15° (approx.), confirm that the material is VO_2 (B). The desired phase was successfully achieved, as every peak with an intensity above 5 is present and the characteristic peaks at approx. 14° and 15° are clearly visible, confirming that B phase has been synthesised as these peaks are absent in XRD spectra of other VO_2 (B) phases.[4] Moreover, there was no V_2O_5 left over or formed, as though the XRD patterns are similar, VO_2 (B) shows its strongest intensity at the (110) peak, whereas V_2O_5 exhibits the highest intensity at (001).[5] The hydrothermally synthesised VO_2 (B) also displays sharp peaks, demonstrating superior crystallinity.[6,7]

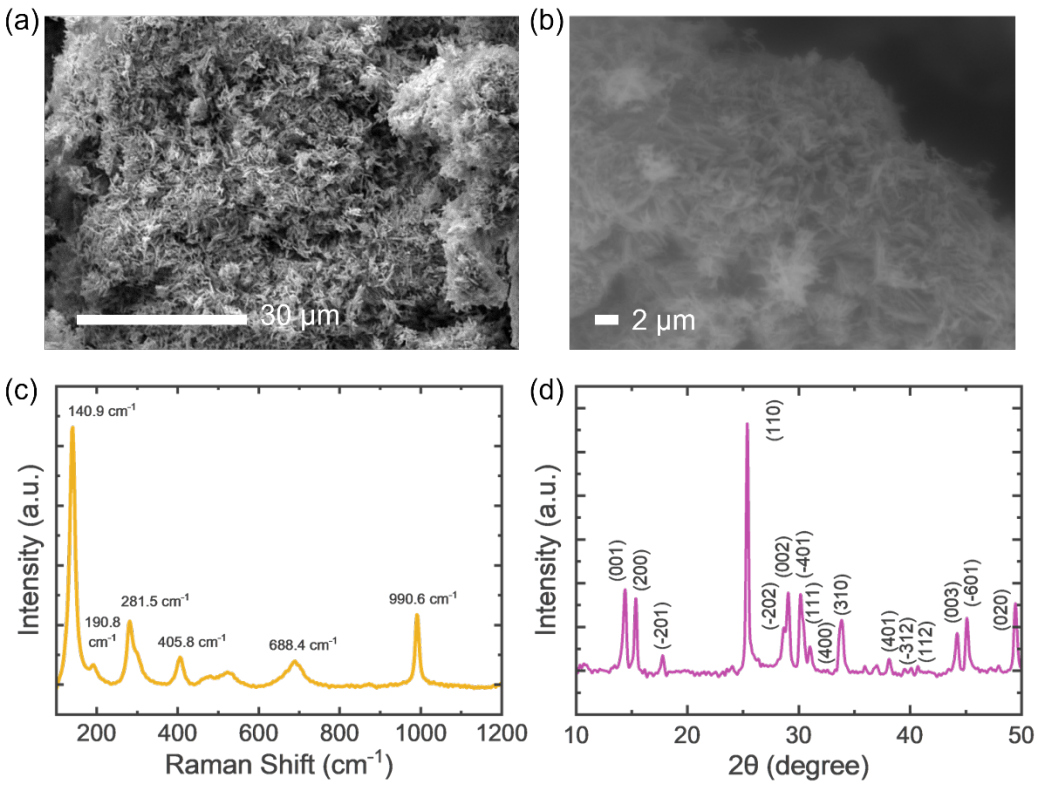

Figure S1. *Characterisations of VO_2(B), cathode material; SEM images of VO2(B) at (a) normal and (b) high magnification. (c) Raman spectrum and d) XRD spectrum.*

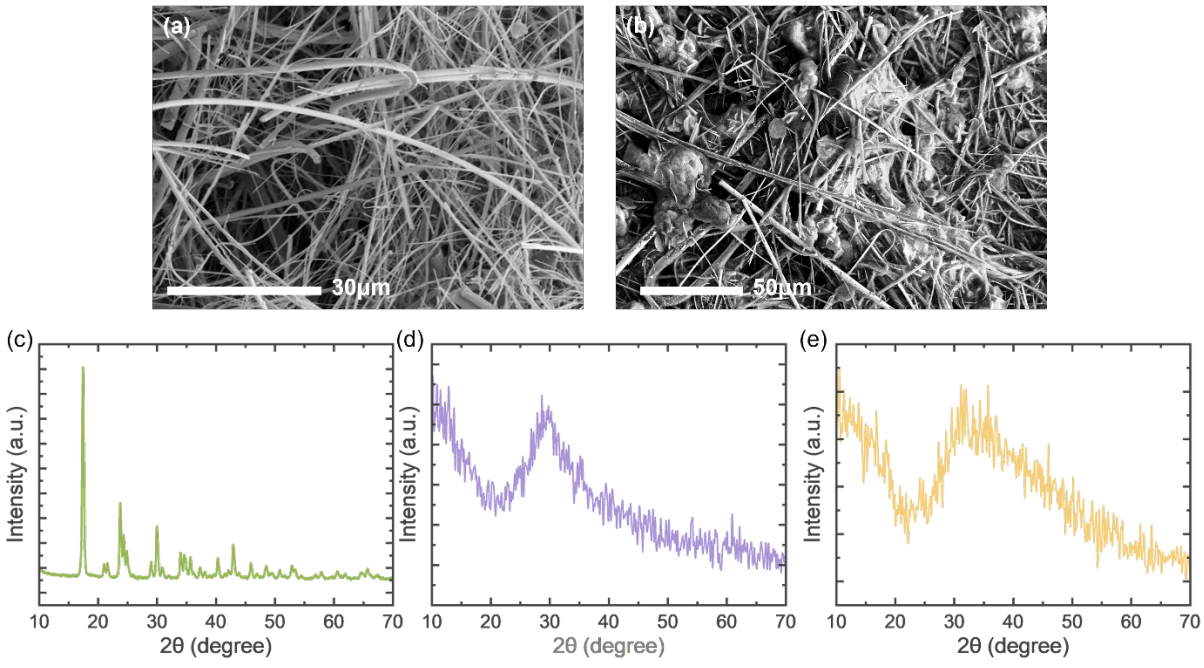

Figure S2. *SEM images of (a) the pristine separator and (b) the separator with electrolyte used in the ZIBs assembled and tested. XRD spectra of (c) $Zn(CF_3SO_3)_2$ salt, (d) pristine separator and (e) separator with electrolyte solution dropped on top.*

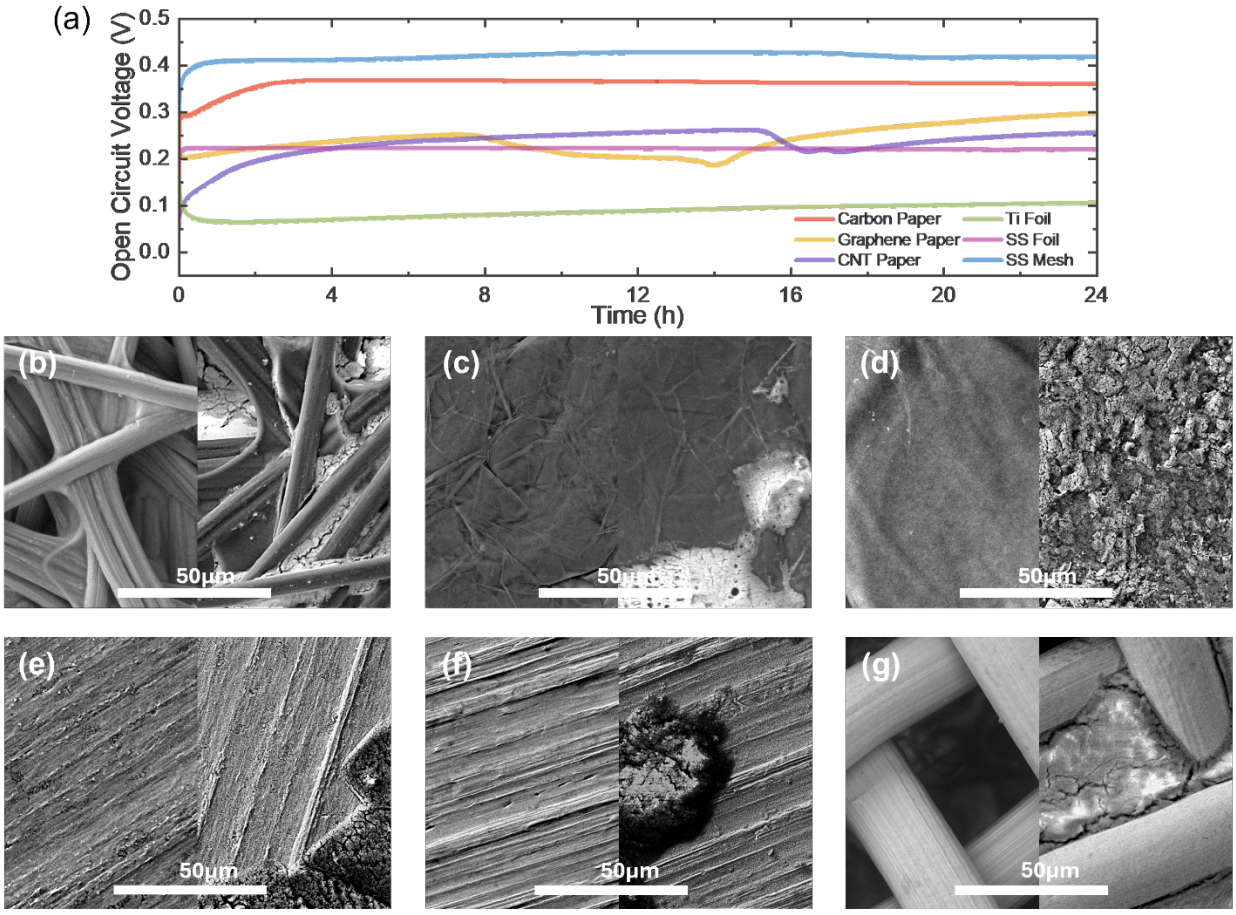

Figure S3. *(a) OCV measurement of current collectors for 24 hours with no applied voltage. SEM images of the pristine current collectors before (left) and after (right) the measurement; (b) carbon paper, (c) graphene paper, (d) CNT paper, (e) titanium foil, (f) stainless steel foil and (g) stainless steel mesh.*

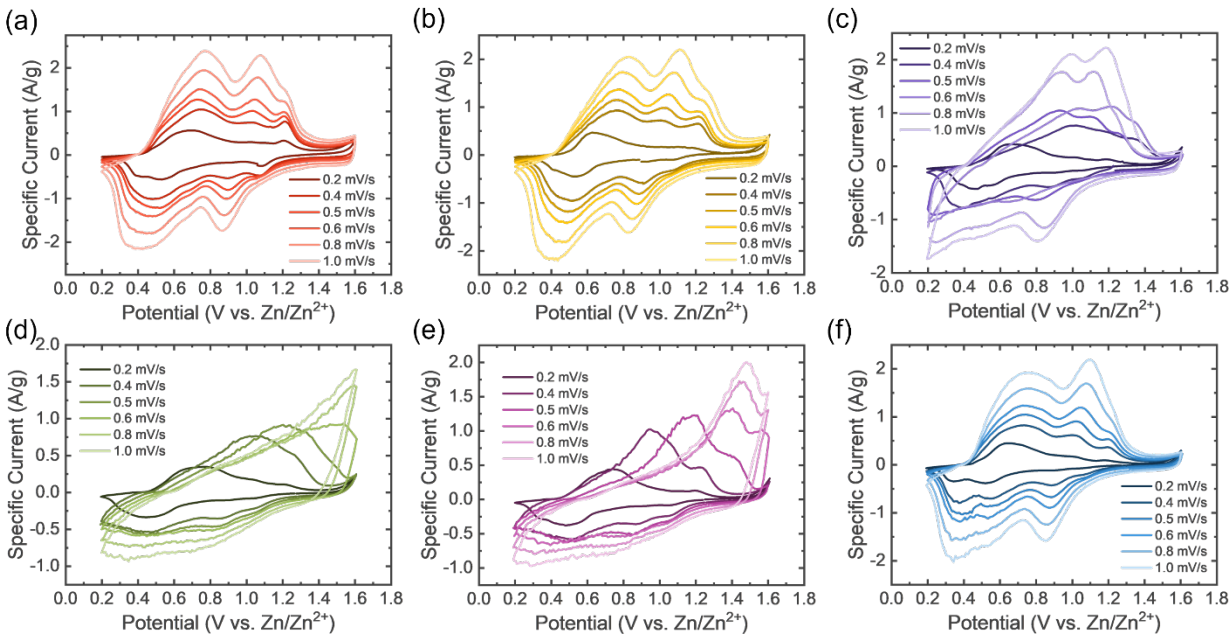

Figure S4. *CV curves of each current collector; (a) carbon paper, (b) graphene paper, (c) CNT paper, (d) titanium foil, (e) stainless steel foil and (f) stainless steel mesh.*

Current Collector Material	Capacity Retention
Carbon Paper	83.6%
Graphene Paper	40.0%
CNT Paper	0.00%
Titanium Foil	49.4%
Stainless Steel Foil	22.7%
Stainless Steel Mesh	93.3%

Table S1 *– Capacity retention of cells with different current collectors after long term cycling for 1000 cycles at 2000 mA/g.*

References

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