Supplemental Files

Engineering the crystal facets of α-MnO_2 nanorods for electrochemical energy storage: experiment and theory

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1. The EDS results of α-MnO_2

The EDS was used to analyze the elemental composition of the as-prepared samples. The weight percent of Mn, O and K (deduct the C element) is shown in **Table S1**. The Mn and O content is nearly close, which is in accordance with the XPS results and further indicates the successful preparation of MnO_2.

Table S1 The weight percent (%) of Mn, O and K for α-MnO_2 based on EDS results.

Samples	Mn	O	K
α-MnO_2-200	68.85	24.94	6.14
α-MnO_2-110	71.84	22.23	5.92
α-MnO_2-310	69.86	21.82	8.32

2. The effect of KOH concentrations on the electrochemical performance of α-MnO_2-310

KOH was applied as an alkaline etchant to improve the electrochemical performance of α-MnO_2-310. **Fig.S1a** shows the CV curves of as-prepared α-MnO_2-310 at the scan rate of 10 mV/s. Compared to α-MnO_2-310 treated with other concentrations of KOH, the α-MnO_2-310 after 4 M KOH treatment displays the larger area and broader region. The GCD curves of α-MnO_2-310 with different concentrations of KOH at 0.5 A/g are depicted in **Fig. S1b**. Among, the α-MnO_2-310 treated with 4 M KOH displays the highest specific capacitance of 133 F/g, which is better than their counterparts in terms of specific capacitance values. Thus, we finally choose 4 M as the optimum concentration for the treatment of α-MnO_2-310.

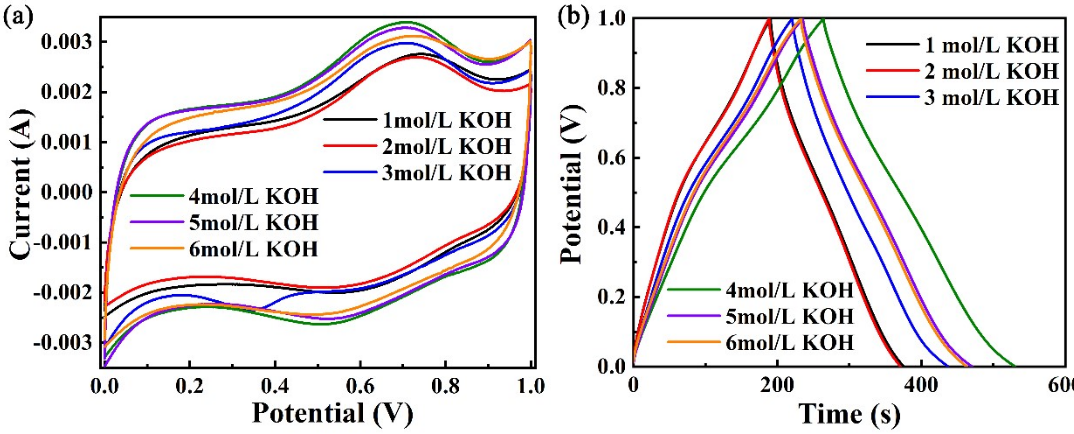

Fig. S1 Electrochemical properties of as-prepared α-MnO_2-310 treated with different concentrations of KOH: (a) CV curves at a scan rate of 10 mV/s, (b) GCD curves at 0.5 A/g.

3. The electrochemical performances in the two-electrode case

In order to further explore the practical application of as-prepared α-MnO_2, the electrochemical performances in the two-electrode case were evaluated, while using the α-MnO_2-310 as the positive electrode, the activated carbon (AC) as the negative electrode, and 0.5 M Na_2SO_4 as electrolyte. **Fig.S2a** shows the CV curves of MnO_2//AC assymmetric supercapacitor at different scan rates. It can be seen that all the CV curves exhibit a quasi-rectangular shaped capacitive behavior, which indicate the good reversibility and pseudocapacitive behavior. Meanwhile, the GCD curves with the current densities from 0.5 A g^{-1} to 5 A g^{-1} (**Fig.S2b**) show a symmetrical triangle shape, indicating that the assembled asymmetric supercapacitor has excellent reversibility and high coulombic efficiency. The calculated specific capacitance was 29.17 F/g at a current density of 0.5 A g^{-1}. Besides, the capacity retention ratio was 47.14% when the current density increasing to 5 A g^{-1} (**Fig.S2c**). The energy density can reach 5.83 Wh kg^{-1} at a power density of 300 W kg^{-1}, which is better than the commercial AC//AC symmetric supercapacitors (**Fig.S2d**).[1-3]

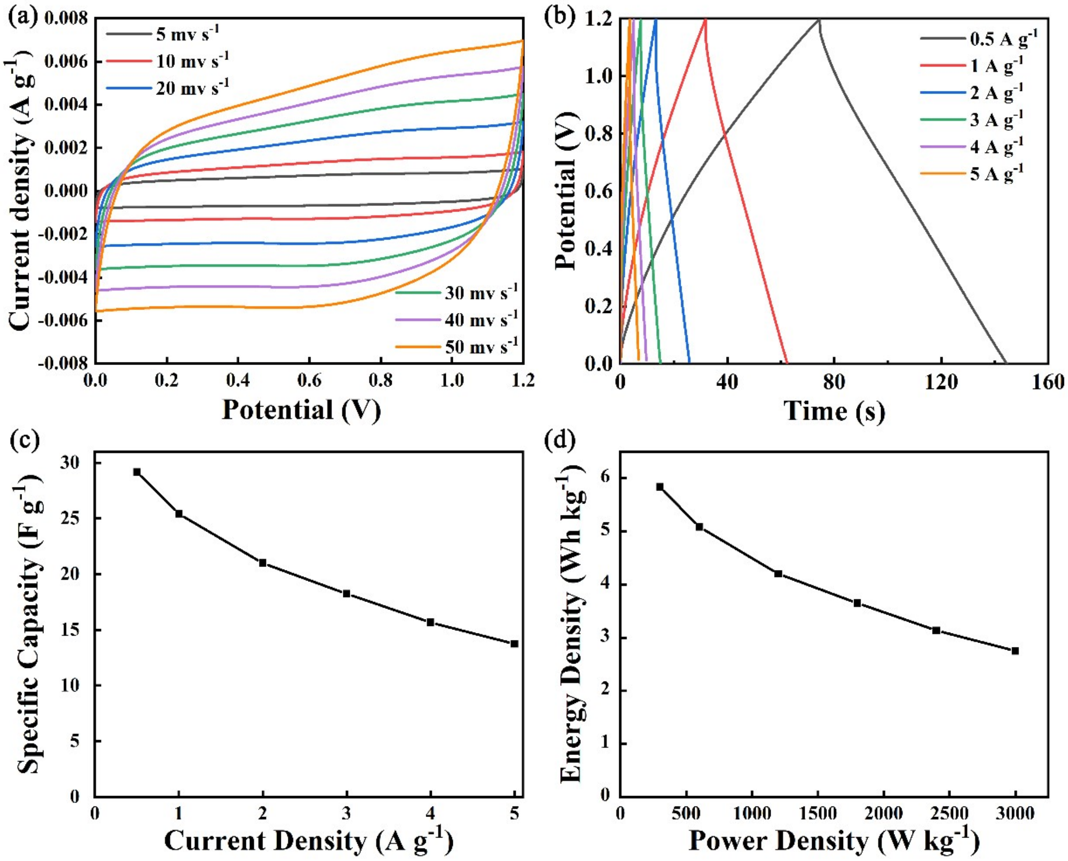

Fig. S2 Electrochemical properties of MnO_2//AC assymmetric supercapacitor: (a) CV curves at different scan rates, (b) GCD curves at different current densities, (c) the calculated specific capacity at various current densities and (d) Ragone plots.

References

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