# Supplementary Materials

## Synthesis of Different Manganese Tungstate Nanostructures for Enhanced Charge Storage Application: Theoretical support of the Experimental Finding

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**Table S1: Values of equivalent circuit components.**

| Component | Value | | |
|---|---|---|---|
| | MWO24 | MWO18 | MWO12 |
| $R_1$ (ohm) | 0.51 | 1.18 | 2.36 |
| $R_2$ (ohm) | 1.01 | 1.34 | 1.50 |
| $R_3$ (ohm) | 1.55 | 26.97 | 2.99 |
| $W_1$ (ohm $S^{-1/2}$) | 45.49 | 59.7 | 55.22 |
| $W_2$ (ohm $S^{-1/2}$) | 0.86 | 3.01 | 2.24 |
| $C_1$ (F) | $0.152\times10^{-3}$ | 1.514 | $0.129\times10^{-3}$ |
| $C_2$ (F) | 0.117 | 0.079 | 0.912 |
| $C_3$ (F) | 0.99 | 2.87 | 0.62 |

**Table S2: Electrochemical performance comparison:**

| Electrode material | Electrolyte | Specific capacitance | Potential window | Cycling stability | Ref. |
|---|---|---|---|---|---|
| **$MnWO_4$/ RGO** | 6 M KOH | 288 $Fg^{-1}$ at 5 mV $s^{-1}$ | -0.35 to 0.55 V | 14.9% after 6000 cycles | 1 |
| **$MnWO_4$** | 1 M $Na_2SO_4$ | 386 $Fg^{-1}$ at 5 $mVs^{-1}$ | 0 to 1 V | 90% after 2000 cycles | 2 |
| **$MnWO_4$** | 1 M KOH | 295 $Fg^{-1}$ at 5 $mVs^{-1}$ | -0.2 to 0.6 V | > 100% after 3000 cycles | 3 |
| **$MnWO_4$ micro flower** | 1 M $Na_2SO_4$ | 324 $Fg^{-1}$ at 1 mA $cm^{-2}$ | 0 to 1 V | 93% after 8000 | 4 |
| **$MnWO_4$ (using DNA scaffold)** | 0.1 M $Na_2SO_4$ | 34 $Fg^{-1}$ at 0.5 mA $cm^{-2}$ | 0 to 1 V | **-** | 5 |
| **$MnWO_4$ (using CTAB)** | 1 M $H_2SO_4$ | 27 $Fg^{-1}$ at 5 $mVs^{-1}$ and 16 $Fg^{-1}$ at 1.3 mA $cm^{-2}$ | -0.2 to 1 V and 0 to 1 V | increased after 1000 cycles | 6 |
| **$MnWO_4$@ aCNT** | 1 M KOH | 542.18 $Fg^{-1}$ at 2 $mVs^{-1}$ | -0.1 to 0.6 V | Above 100% after 15,000 cycles | 7 |
| **$MnWO_4$** | 0.1 M NaOH | 199 $Fg^{-1}$ at 2 $mVs^{-1}$ | 0 to 0.5 V | 62% after 1200 cycles | 8 |
| **$WO_3$- RGO composite** | 0.5 M $H_2SO_4$ | 495 $Fg^{-1}$ at 1 $Ag^{-1}$ | -0.4 to 0.3 V | 87.5% after 1000 cycles | 9 |
| **$WO_3$** | 0.5 M $H_2SO_4$ | 319.26 $Fg^{-1}$ at 0.7 $Ag^{-1}$ | -0.41 to 0 V | 83.2% after 6000 cycles | 10 |
| **$WO_3$** | 1 M $Na_2SO_4$ | 266 $Fg^{-1}$ at 10 $mVs^{-1}$ | -0.7 to 0.4 V | 81% after 1000 cycles | 11 |
| **$WO_3$– $WO_3 \cdot 0.5$ $H_2O$** | 0.5 M $H_2SO_4$ | 290 $Fg^{-1}$ at 25 $mVs^{-1}$ | -0.6 to 0.2 V | 72% after 100 cycles | 12 |
| **$MnWO_4$** | **KOH** | **455.07 $Fg^{-1}$ at 2 $mVs^{-1}$** | **-0.1 to 0.6 V** | **94% after 10,000 cycles** | **This work** |

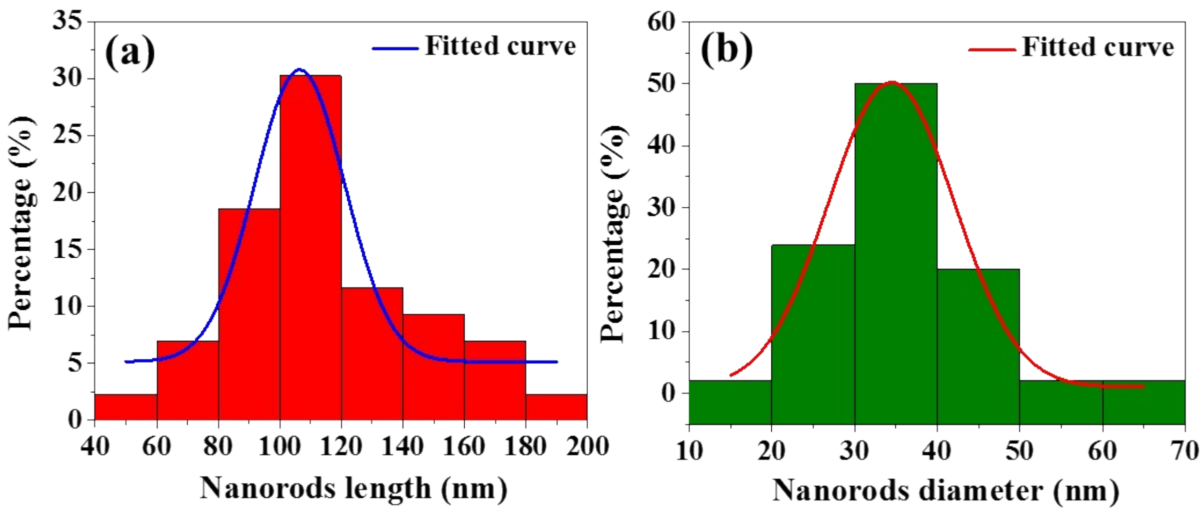


**Fig. S1:** Percentage distribution of (a) rod length and (b) rod diameter of MWO24 from TEM analysis.

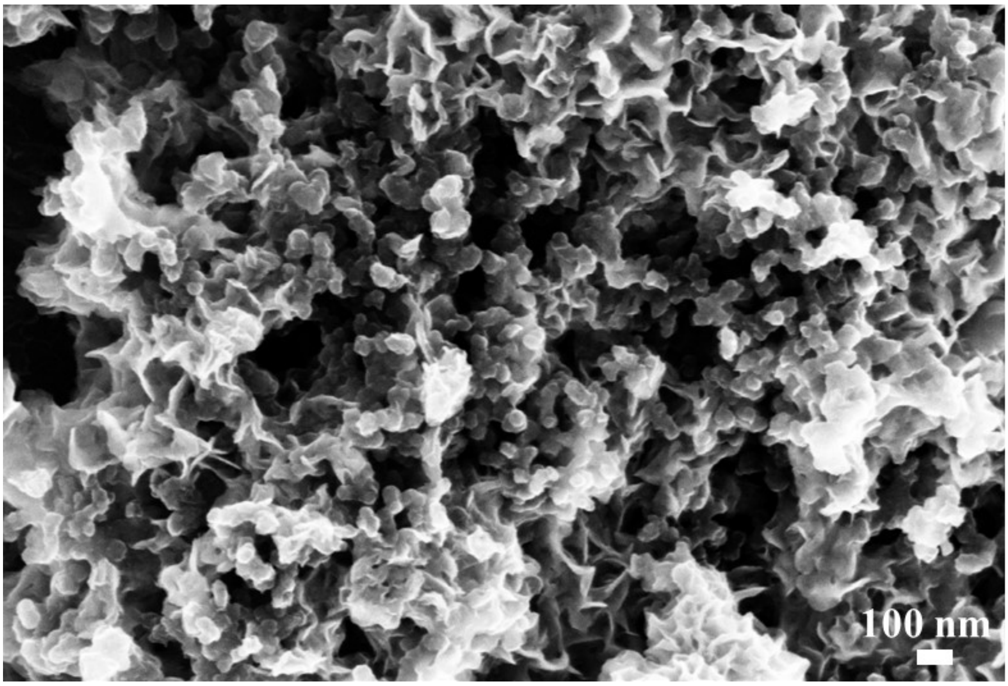


**Fig. S2:** FESEM image of MWO24 electrode after 10000 cycles.

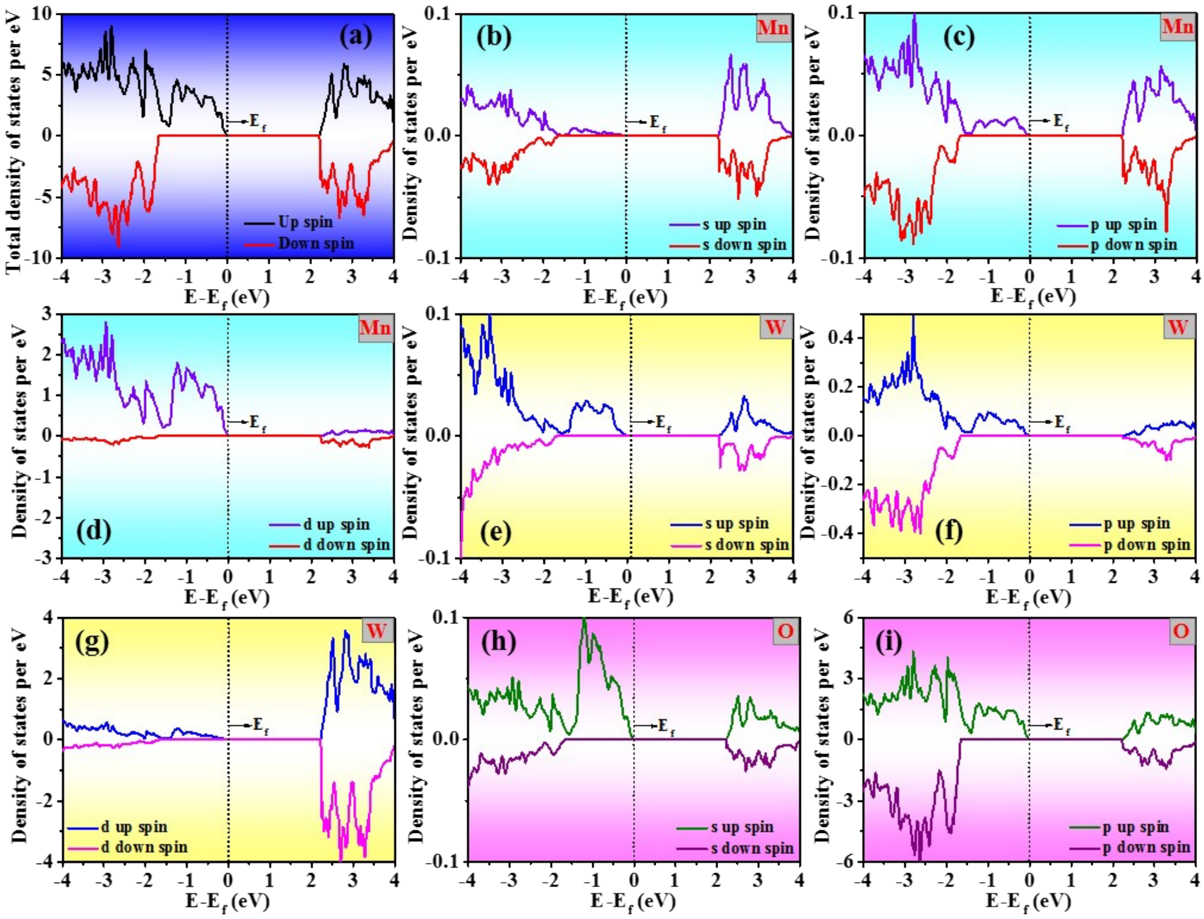


**Fig. S3:** (a) Total density of states (TDOS) for (-111) surface of $MnWO_4$, Partial density of state (PDOS) [(-111) surface of $MnWO_4$] for (b) Mn s orbital, (c) Mn p orbital, (d) Mn d orbital, (e) W s orbital, (f) W p orbital, (g) W d orbital (h) O s orbital and (i) O 2p orbital in 3D configuration. The Fermi level is indicated by the dotted line.

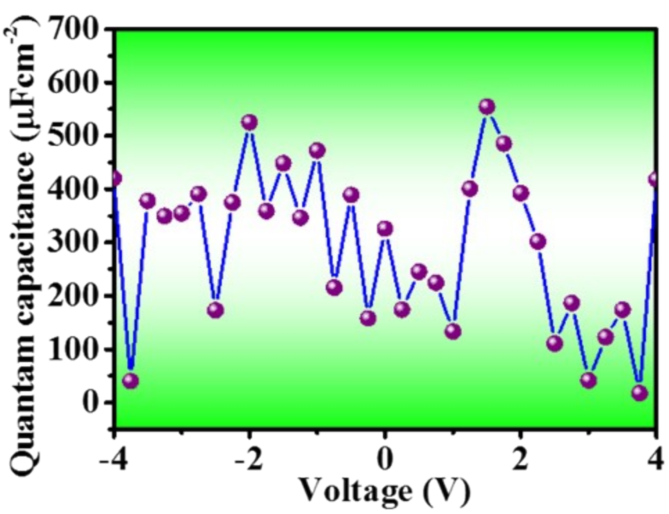

**Fig. S4:** Variation of quantum capacitance of $MnWO_4$ surface as a function of voltage using DFT D3-BJ method.

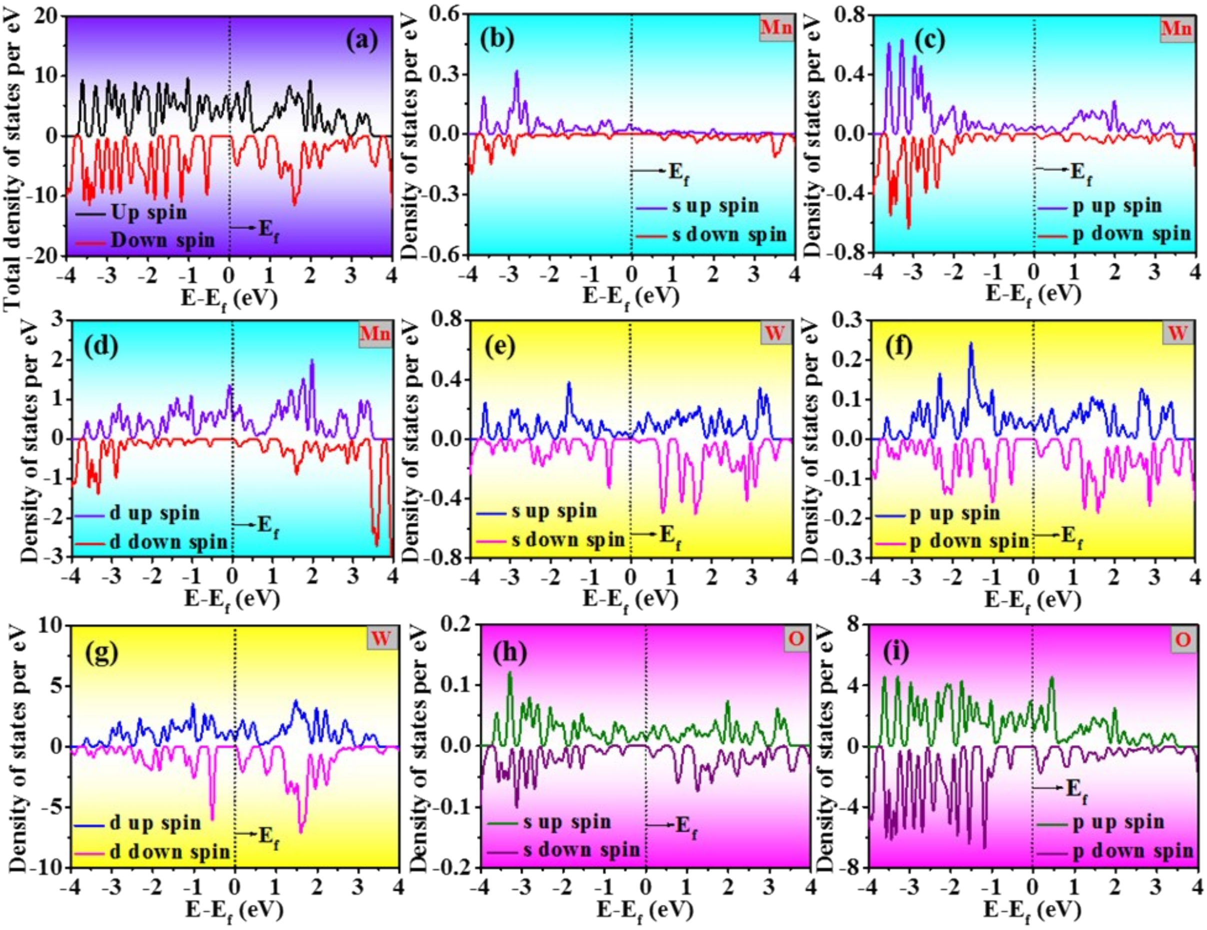


**Fig. S5:** (a) Total density of states (TDOS) for (-111) surface of $MnWO_4$, Partial density of state (PDOS) [(-111) surface of $MnWO_4$] for (b) Mn s orbital, (c) Mn p orbital, (d) Mn d orbital, (e) W s orbital, (f) W p orbital, (g) W d orbital (h) O s orbital and (i) O 2p orbital in 2D configuration (using DFT D3-BJ method). The Fermi level is indicated by the dotted line.

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