Supporting Information

Asymmetric Paper Supercapacitor Based on Amorphous Porous Mn$_3$O$_4$ Negative Electrode and Ni(OH)$_2$ Positive Electrode: A Novel and High-Performance Flexible Electrochemical Energy Storage Device

Jin-Xian Feng, Sheng-Hua Ye, Xue-Feng Lu, Ye-Xiang Tong, and Gao-Ren Li*

MOE Laboratory of Bioinorganic and Synthetic Chemistry, KLGHEI of Environment and Energy Chemistry, School of Chemistry and Chemical Engineering, Sun Yat-sen University, Guangzhou 510275, China

E-mail: ligaoren@mail.sysu.edu.cn, Fax: 86-20-84112245; Tel: 86-20-84110071.

Scheme S1. Schematic illustration for the fabrication of conducting paper (Ni/graphite/paper, NGP).
Figure S1. CVs of the amorphous porous Mn₃O₄/NGP electrode at scan rates of 5~100 mV/s.

Figure S2. CVs of the crystalline Mn₃O₄/NGP electrode at scan rates of 5~100 mV/s.
Figure S3. Galvanostatic charge-discharge curves of the crystalline Mn$_3$O$_4$/NGP at different current densities.

Figure S4. Areal $C_{sp}$ and $C_{sp}$ retention of the amorphous porous Mn$_3$O$_4$/NGP electrode as a function of current density.
Figure S5. The dependence of areal $C_{sp}$ of amorphous porous Mn$_3$O$_4$/NGP on deposition time of Mn$_3$O$_4$.

Figure S6. SEM image of the crystalline Mn$_3$O$_4$/NGP.
**Figure S7.** XRD patterns of the crystalline Mn$_3$O$_4$/NGP and NGP.

**Figure S8.** (a) Nyquist plots of amorphous porous Mn$_3$O$_4$/NGP and crystalline Mn$_3$O$_4$/NGP electrodes; (b) The magnified Nyquist plot of the amorphous porous Mn$_3$O$_4$/NGP; (c) The magnified Nyquist plot of the crystalline Mn$_3$O$_4$/NGP.
Figure S9. SEM image of the amorphous Ni(OH)$_2$/NGP electrode.

Figure S10. XRD patterns of the amorphous Ni(OH)$_2$/NGP electrode and NGP substrate.
Figure S11. XPS spectra of Ni 2p in the amorphous Ni(OH)$_2$/NGP electrode.

Figure S12. CVs of the amorphous Ni(OH)$_2$/NGP electrode and the bare NGP.
Figure S13. CVs of the amorphous Ni(OH)$_2$/NGP electrode at scan rates of 5~100 mV/s.

Figure S14. Areal $C_{sp}$ and $C_{sp}$ retention of the amorphous Ni(OH)$_2$/NGP electrode as a function of scan rate.
**Figure S15.** The galvanostatic charge-discharge curves of the amorphous Ni(OH)$_2$/NGP electrode.

![Graph showing the galvanostatic charge-discharge curves of the amorphous Ni(OH)$_2$/NGP electrode.](image)

**Figure S16.** Areal $C_{sp}$ and $C_{sp}$ retention of the amorphous Ni(OH)$_2$/NGP electrode as a function of current density.

![Graph showing the areal $C_{sp}$ and $C_{sp}$ retention of the amorphous Ni(OH)$_2$/NGP electrode as a function of current density.](image)
Figure S17. Nyquist plots of the amorphous Ni(OH)$_2$/NGP electrode.

Figure S18. The cyclic performance of the amorphous Ni(OH)$_2$/NGP electrode (82.5% retention) at 100 mV/s.
Figure S19. The galvanostatic charge-discharge curves of the assembled Mn$_3$O$_4$/Ni(OH)$_2$-ASC device at various potential windows at current density of 2 mA/cm$^2$.

Figure S20. Areal $C_{sp}$ and $C_{sp}$ retention of the Mn$_3$O$_4$/Ni(OH)$_2$-ASC device as a function of scan rate.
Figure S21. Areal $C_{\text{sp}}$ and $C_{\text{sp}}$ retention of the Mn$_3$O$_4$/Ni(OH)$_2$-ASC device as a function of current density.
Figure S22. N₂ adsorption-desorption isotherms of the amorphous Mn₃O₄.
Figure S23 N$_2$ adsorption-desorption isotherms of the amorphous Ni(OH)$_2$. 