Supporting Information for

## Pushing the Cycling Stability Limit of Hierarchical Metal Oxide Core/Shell Nanoarrays Pseoducapacitor Electrodes by Nanoscale Interface Optimization<sup>†</sup>

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**Figure S1**. The SEM images of the surface of different substrates. (a) Silicon (b) Ni foam and (c) graphene foam.

**Table S1**. The lattice mismatch between different planes of  $\alpha$ -MnO<sub>2</sub> and (100)  $_{\delta$ -MnO<sub>2</sub>

Planes	S <sub>a</sub>	S <sub>b</sub>
(200)	9%	0.7%
(310)	19.5%	0.7%
(510)	23.5%	0.7%
(002)	9%	15%
(110)	1.8%	0.7%



**Figure S2.** The XRD pattern of the  $MnO_2@NiO$  arrays fabricated on the graphene foam and the  $Co_3O_4@MnO_2$  arrays fabricated on the Ni foam.



Figure S3. The XPS patterns and the Mn2p patterns of the as-prepared and treated  $MnO_2@MnO_2$  arrays.



Figure S4. The EDS mapping of the Co<sub>3</sub>O<sub>4</sub>@ MnO<sub>2</sub> arrays after the treatment.



Figure S5. The SEM image of the  $Co_3O_4$  nanowires.

Electrode	Mn	Ni
Untreated MnO <sub>2</sub> @NiO	68%	32%
Treated MnO <sub>2</sub> @NiO	77.65%	22.35%

Table S3. The EDS results of Co<sub>3</sub>O<sub>4</sub>@MnO<sub>2</sub> wires (normalized)

Electrode	Со	Mn
Untreated Co <sub>3</sub> O <sub>4</sub> @MnO <sub>2</sub>	65.42%	34.58%
Treated Co <sub>3</sub> O <sub>4</sub> @MnO <sub>2</sub>	73.62%	26.38%

**Table S4.** The mass loading of the HOMNTAs electrodes

Electrode	Mass loading	Mass loading
	(As-prepared)	(Treated)
Untreated MnO <sub>2</sub> @MnO <sub>2</sub>	0.985 mg cm <sup>-2</sup>	
Treated MnO <sub>2</sub> @MnO <sub>2</sub>		0.977 mg cm <sup>-2</sup>
Untreated MnO <sub>2</sub> @NiO	1.15 mg cm <sup>-2</sup>	
Treated MnO <sub>2</sub> @NiO	1.32 mg cm <sup>-2</sup>	1.09 mg cm <sup>-2</sup>
Untreated Co <sub>3</sub> O <sub>4</sub> @MnO <sub>2</sub>	1.023 mg cm <sup>-2</sup>	
Treated Co <sub>3</sub> O <sub>4</sub> @MnO <sub>2</sub>	1.21 mg cm <sup>-2</sup>	1.05 mg cm <sup>-2</sup>



**Figure S6.** The CV curves of (a) untreated and (b) treated MnO<sub>2</sub>@MnO<sub>2</sub> arrays, (c) untreated and (d) MnO<sub>2</sub>@NiO arrays, (e) untreated and (f) treated Co<sub>3</sub>O<sub>4</sub>@MnO<sub>2</sub> wires at different scan rates.



Figure S7. The Galvanostatic constant-current charge/discharge performance of (a) untreated and (b) treated  $MnO_2@MnO_2$  arrays, (c) untreated and (d)  $MnO_2@NiO$  arrays, (e) untreated and (f) treated  $Co_3O_4@MnO_2$  wires at different scan rates.



Figure S8. The CV curves of the Ni foam at different scan rates.



**Figure S9.** The SEM images of the (a) untreated and (b) treated MnO<sub>2</sub>@MnO<sub>2</sub> arrays after supercapacitor fabrication.