

Supporting Information for

# Freestanding Eggshell Membrane-Based Electrodes for High-Performance Supercapacitor and Oxygen Evolution Reaction

Jing Geng,<sup>a,†</sup> Hao Wu,<sup>a,†</sup> Abdullah M. Al-Enizi,<sup>b</sup> Ahmed A. Elzatahry,<sup>c</sup> Gengfeng Zheng<sup>a,\*</sup>

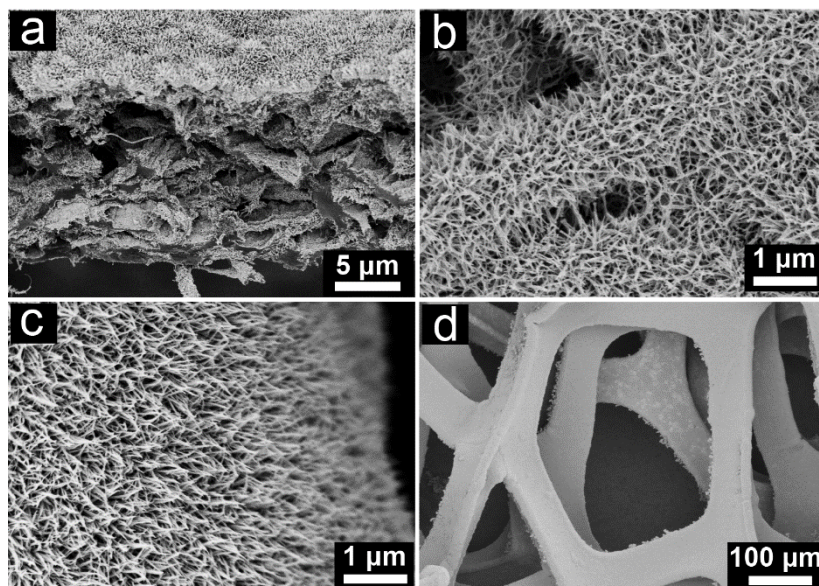
<sup>a</sup> *Laboratory of Advanced Materials, Department of Chemistry, Collaborative Innovation Center of Chemistry for Energy Materials, Fudan University, Shanghai, 200433, China.*

<sup>b</sup> *Department of Chemistry, College of Science, King Saud University, Riyadh 11451, Saudi Arabia.*

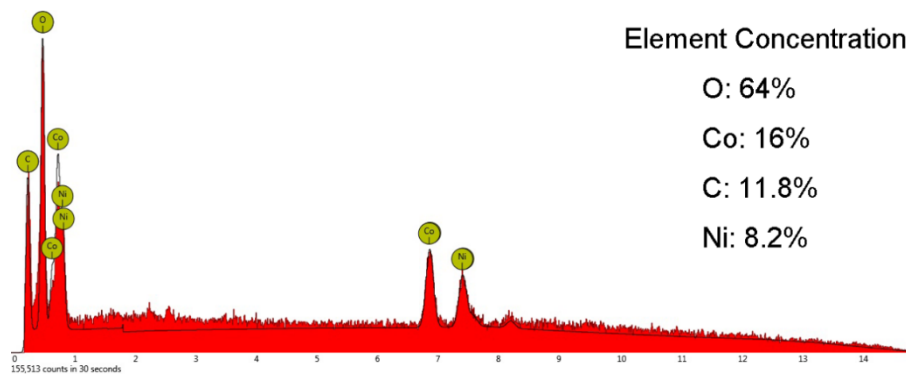
<sup>c</sup> *Materials Science and Technology Program, College of Arts and Sciences, Qatar University, PO Box 2713, Doha, Qatar.*

† These authors contributed equally.

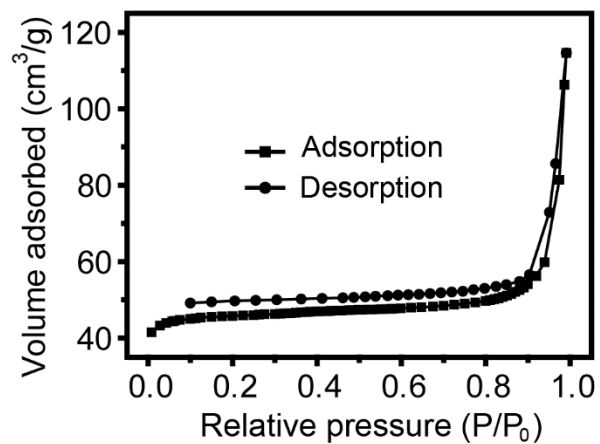
\*E-mail: gfzheng@fudan.edu.cn



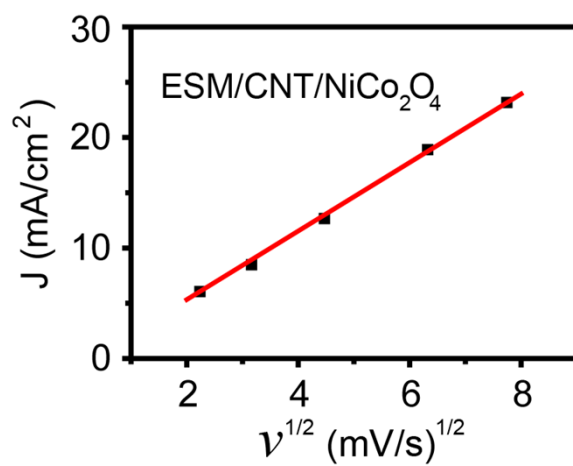
**Fig. S1.** (a) Side-view SEM image of ESM/CNT/NiCo<sub>2</sub>O<sub>4</sub>. (b) SEM image of ESM/ NiCo<sub>2</sub>O<sub>4</sub> composite. (c, d) High and low magnification SEM images of Ni foam/NiCo<sub>2</sub>O<sub>4</sub> composite.



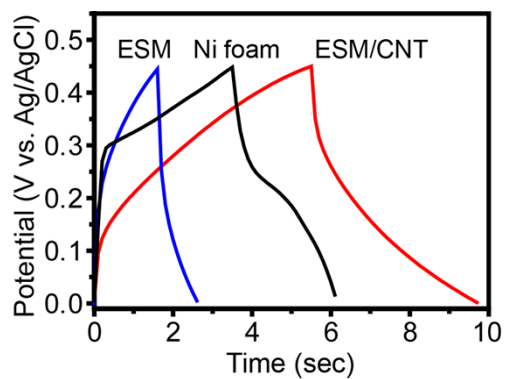
**Fig. S2.** EDS spectrum of the ESM/CNT/NiCo<sub>2</sub>O<sub>4</sub> composite.



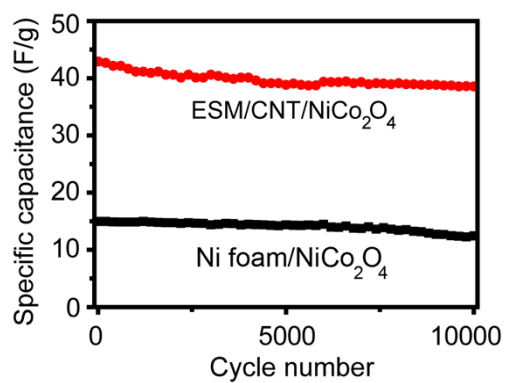
**Fig. S3.** N<sub>2</sub> sorption isotherms of the carbonized ESM.



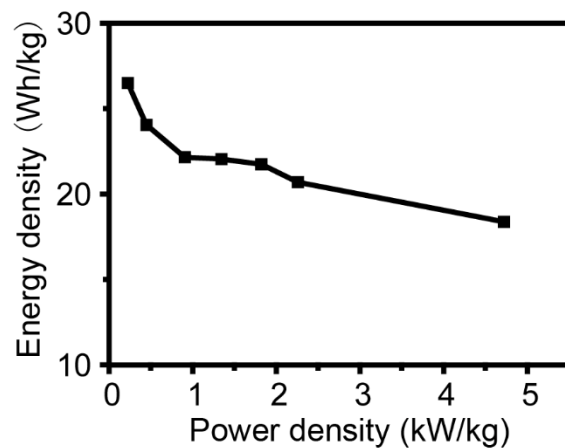
**Fig. S4.** Linear plot: peak values of current density versus square-root of sweep rate ( $v$ ).



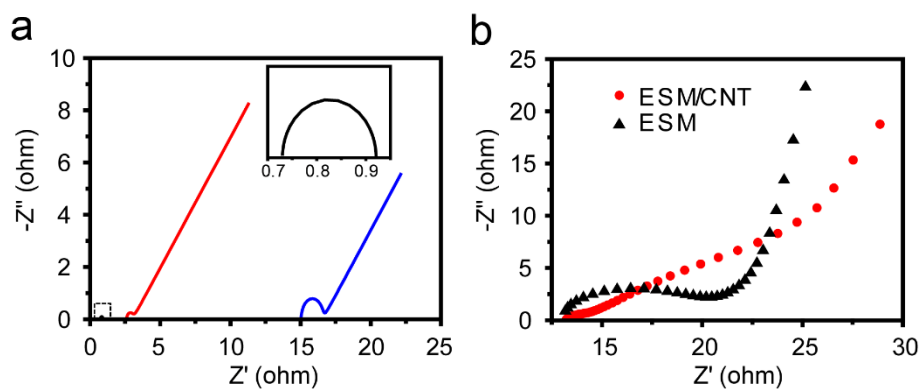
**Fig. S5.** Charge-discharge curves of ESM, Ni foam and ESM/CNT at a current density of 0.5 A/g.



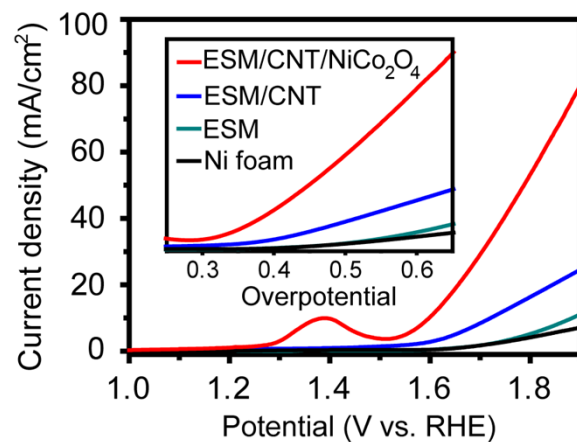
**Fig. S6.** Cycling performance based on total mass of ESM/CNT/NiCo<sub>2</sub>O<sub>4</sub> and Ni foam/NiCo<sub>2</sub>O<sub>4</sub> electrodes, respectively.



**Fig. S7.** Ragone plot of the energy density and power density of ESM/CNT/NiCo<sub>2</sub>O<sub>4</sub> electrode at various charge–discharge rates.



**Fig. S8.** (a) Modeled Nyquist plots of Ni foam/NiCo<sub>2</sub>O<sub>4</sub> (black), ESM/CNT/NiCo<sub>2</sub>O<sub>4</sub> (red) and ESM/ NiCo<sub>2</sub>O<sub>4</sub> (blue). Inset: magnified modeled Nyquist plots of Ni foam/NiCo<sub>2</sub>O<sub>4</sub>. (b) Nyquist plots of the ESM and ESM/CNT.



**Fig. S9.** Linear scan voltammogram plots of the ESM/CNT/NiCo<sub>2</sub>O<sub>4</sub>, ESM/CNT, ESM and Ni foam substrates at a scan rate of 5 mV/s in 1 M KOH electrolyte. Inset: corresponding data replotted as the current density versus overpotential.