Supporting Information for

Activated Carbon by One-Step Calcination of Deoxygenated Agar for High Voltage Lithium Ion Supercapacitor

Ming Zhang,[†,‡,⊥] Junfang Cheng,[§,⊥] Lixing Zhang,[∥] Yaoting Li,[‡] MaoSung Chen,[‡] Yao Chen*[,∥] and Zhongrong Shen*[,†,‡]

[†]State Key Laboratory of Structural Chemistry, Fujian Institute of Research on the Structure of Matter, Chinese Academy of Sciences, Fuzhou, Fujian 350002, PR China

[‡]The Laboratory of Rare-Earth Functional Materials and Green Energy, Xiamen Institute of Rare-earth Materials, Haixi Institutes, Chinese Academy of Sciences, Xiamen 361021, China

[§]International Institute for Carbon-Neutral Energy Research (WPI-I2CNER), Kyushu University, 744 Motooka, Nishi-ku, Fukuoka, 819-0395, Japan

[∥]The State Key Laboratory of Refractories and Metallurgy, Wuhan University of Science and Technology, Wuhan, 430081, China

[⊥]M.Z. and J.C. contributed equally to this work.

*E-mail: y.chen@wust.edu.cn (Y. C.).

*E-mail: z-shen@fjirsm.ac.cn (Z. S.),

Number of pages: 7

Number of figures: 4

Number of tables: 0

Content

1. Calculation

The Specific capacitance values are calculated via equation (1), where C [F g^{-1}] is the specific capacitance, m [mg] is the mass loading of AC, v [V s^{-1}] is the scan rate, V_{min} [V vs RHE] is the minimum electrode potential, V_{max} [V vs RHE] is the maximum potential and i [mA] is the current., the integral part is the area of CV curve at each scan rate.

$$C = \frac{1000}{mv(V_{max} - V_{min})} \int_{V_{min}}^{V_{max}} i(V)dV \qquad (1)$$

Specific energy was calculated by integrating the area beneath the galvanostatic discharge curve of hybrid lithium ion supercapacitor with equation (2), where E [Wh kg^{-1}] is the energy density, U [V] is the cell working voltage, i [mA] is the discharge current, m [mg] is the mass loading of AC, t_{min} [s] is the discharge starting time and t_{max} [s] is discharge ending time.

$$E = \frac{1000i}{3600m} \int_{t_{min}}^{t_{max}} U(t)dt \qquad (2)$$

Specific power was calculated with equation (3), where P [W kg^{-1}] is specific power, E [Wh kg^{-1}] is the specific energy and Δt [s] is the discharge time.

$$P = \frac{3600E}{\Delta t} \qquad (3)$$

2. Supporting Figures

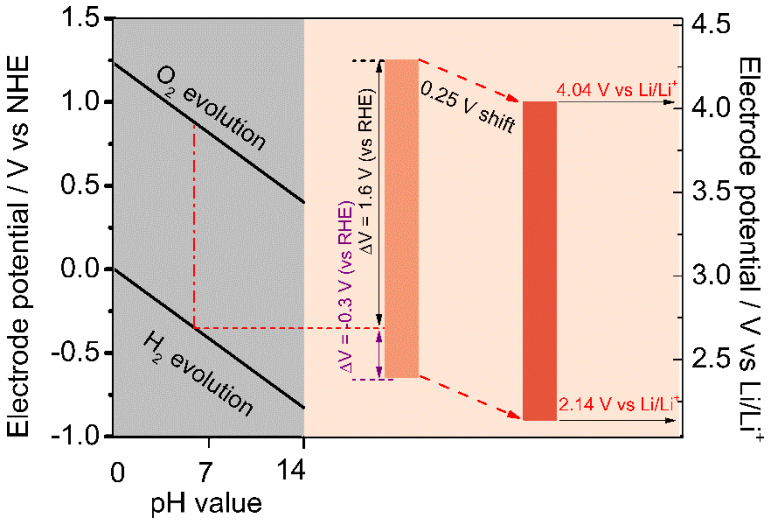

Figure S1. Electrode potential and potential stability window for deoxygenated agar-derived AC electrode in 21 m LiTFSI "water-in-salt" at 25 ℃ and 101.325 kPa. The actually operating potential window of hybrid lithium-ion supercapacitor is between 2.14 V and 4.04 V.

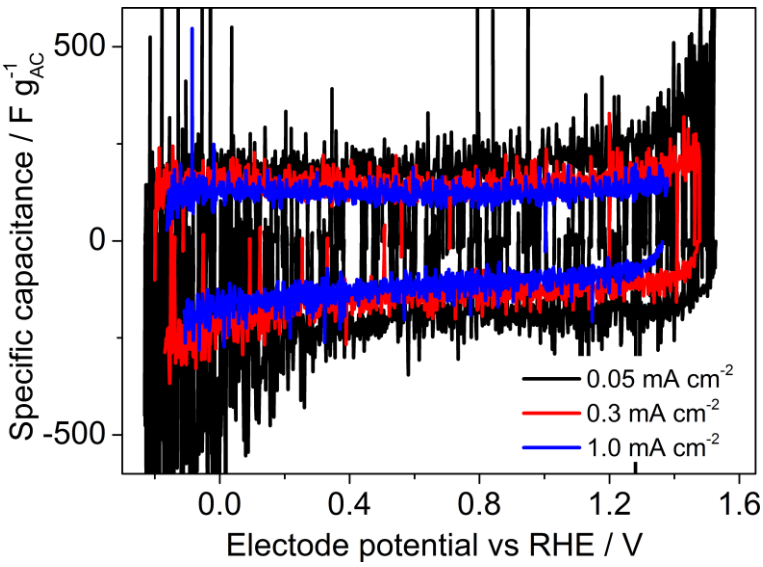

Figure S2. Differential capacitance curves from the charge/discharge curves of activated carbon electrode in the hybrid lithium ion supercapacitor at various current rates from 0.05 to 1.0 mA cm^{-2}.

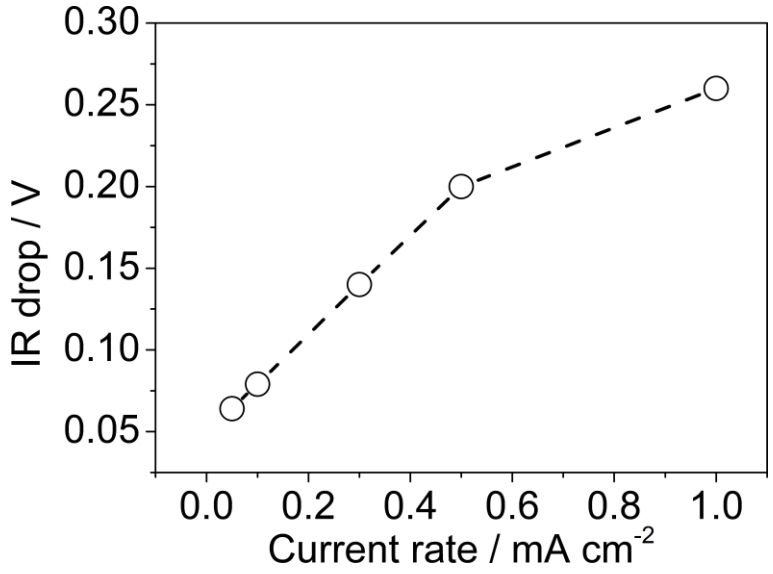

Figure S3. *IR* drops of hybrid lithium-ion supercapacitor at various current rates.

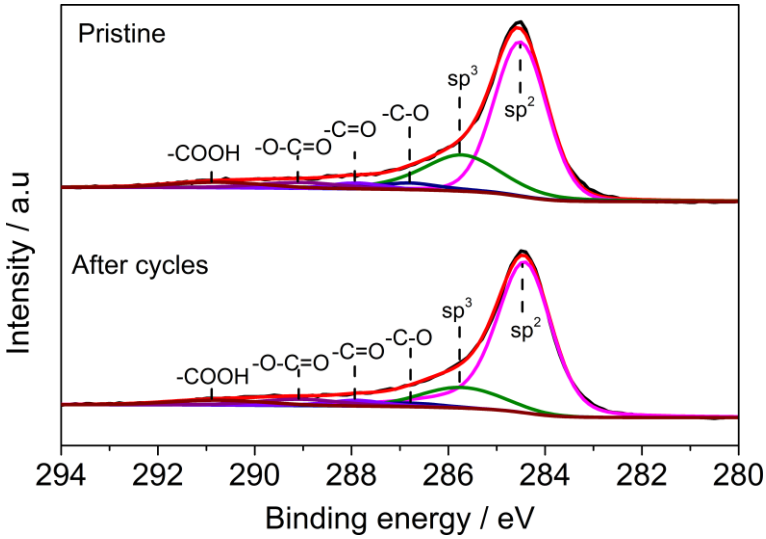

Figure S4. C1s XPS spectra of deoxygenated agar-derived AC before and after cycles.