Graphitic, Porous and Multi-heteroatoms Co-doped Carbon Microtubes Made from Hair Wastes: A Superb and Sustained Anode Substitute for Li-ion Batteries

Jianhui Zhu,^{*a**} Siyuan Liu,^{*b,c*} Yani Liu,^{*b,c*} Ting Meng,^{*b,c*} Lai Ma,^{*b,c*} Han Zhang,^{*b,c*} Minquan Kuang,^{*a*} Jian Jiang^{*b,c**}

^aSchool of Physical Science and Technology, Southwest University, No. 2 Tiansheng Road, Beibei District, Chongqing 400715, P.R. China.
^bInstitute for Clean Energy & Advanced Materials, Faculty of Materials and Energy, Southwest University, No. 2 Tiansheng Road, Beibei District, Chongqing 400715, P.R. China.
^cChongqing Key Laboratory for Advanced Materials and Technologies of Clean Energies, No. 2 Tiansheng Road, Beibei District, China.
^{To} whom correspondence should be addressed: Tel: +86-23-68254842.
*E-mail: jhzhu@swu.edu.cn (J. Zhu); jjiang@swu.edu.cn (J. Jiang).

Page S1: Cover sheet. (Total page number: 4; total figure number: 6)

Page S2: Figure S1. (A-D) SEM observations of hairs-evolved CMTs via the direct calcination method. Figure S2. (A) XRD pattern and (B) Raman spectrum of hairs-evolved CMTs via the direct calcination method.

Page S3: Figure S3. EDS spectra for distinct samples: (A) GP-CMTs and (B) Ni@GP-CMTs. Figure S4. EIS spectra of GP-CMTs before (black) and after (red) long-term cycling.

Page S4: Figure S5. (A-B) SEM and (C) TEM observations, and (D) selected area electron diffraction (SAED) pattern of cycled GP-CMTs.

Figure S6. Cyclic performance of (-)GP-CMTs//LiFePO₄(+) at a current density of 0.15 A/g.



Figure S1. (A-D) SEM observations of hairs-evolved CMTs via the direct calcination method.



Figure S2. (A) XRD pattern and (B) Raman spectrum of hairs-evolved CMTs via the direct calcination method.



Figure S3. EDS spectra for distinct samples: (A) GP-CMTs and (B) Ni@GP-CMTs.



Figure S4. EIS spectra of GP-CMTs before (black) and after (red) long-term cycling.



Figure S5. (A-B) SEM and (C) TEM observations, and (D) selected area electron diffraction (SAED) pattern of cycled GP-CMTs.



Figure S6. Cyclic performance of (-)GP-CMTs//LiFePO₄(+) at a current density of 0.15 A/g.