

Supporting Information

Nanoflakes of Ni-Co LDH and Bi_2O_3 Assembled in 3D Carbon Fiber Network for High-Performance Aqueous Rechargeable Ni/Bi Battery

Xin Li^{‡§}, Cao Guan^{*‡}, Yating Hu[‡], and John Wang^{*‡}

[‡] Department of Materials Science and Engineering, National University of Singapore, 117574 Singapore

[§] Centre for Advanced 2D Materials, National University of Singapore, 117546 Singapore

Corresponding Authors

*E-mail: msegc@nus.edu.sg (C.G.).

*E-mail: msewangj@nus.edu.sg. Website: <http://www.dmse.nus.edu.sg/ACL> (J.W.).

Electrochemical Calculations.

Ni/Bi battery with high performance was assembled using a piece of CC/CNF/Ni-Co LDH and a piece of CC/CNF/Bi₂O₃, with an electrolyte-soaked (3 M KOH) separator in between. The specific capacity (C^* , mA h g⁻¹) of Ni/Bi cells in two-electrode configuration were calculated according to the equation:

$$C^* = I \Delta t / M$$

where I is the discharging current, M is the total mass of the two electrodes' active materials, Δt is the discharge time. For the full cell assembly, to optimize the charge between the two electrodes, the charge of the two electrodes were balanced by $C_- * V_- = C_+ * V_+$, where C_- and C_+ are the charge stored of the negative and positive electrodes, and V_- and V_+ are the potential window of the negative and positive electrodes, respectively. The energy density (E) and power density (P) are calculated according to the equations below:

$$E = \int_0^{\Delta t} IV(t)dt$$

$$P = E / \Delta t$$

where I is the discharging current, V is the discharging voltage, Δt is the discharge time, dt is the time differential.

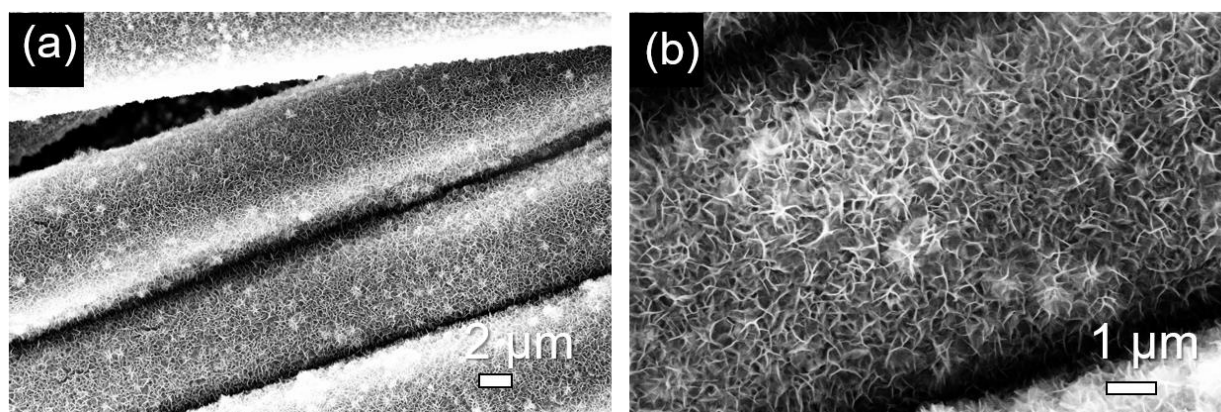


Figure S1. SEM images: (a) Ni-Co LDH grown on the carbon cloth uniformly; (b) Ni-Co LDH grown on the one carbon fiber of carbon cloth with nanoflake morphology.

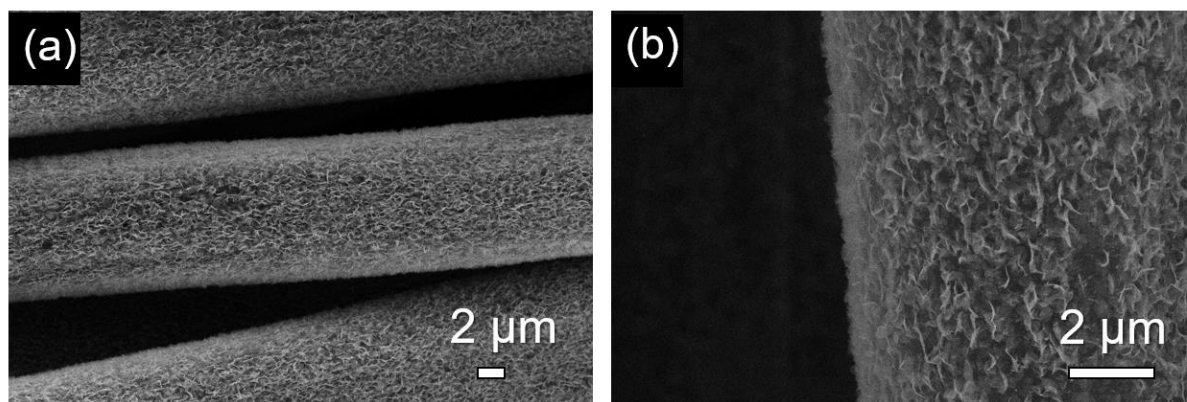


Figure S2. SEM images: (a) Bi₂O₃ grown on the carbon cloth uniformly; (b) Bi₂O₃ grown on the one carbon fiber of carbon cloth with nanoflake morphology.

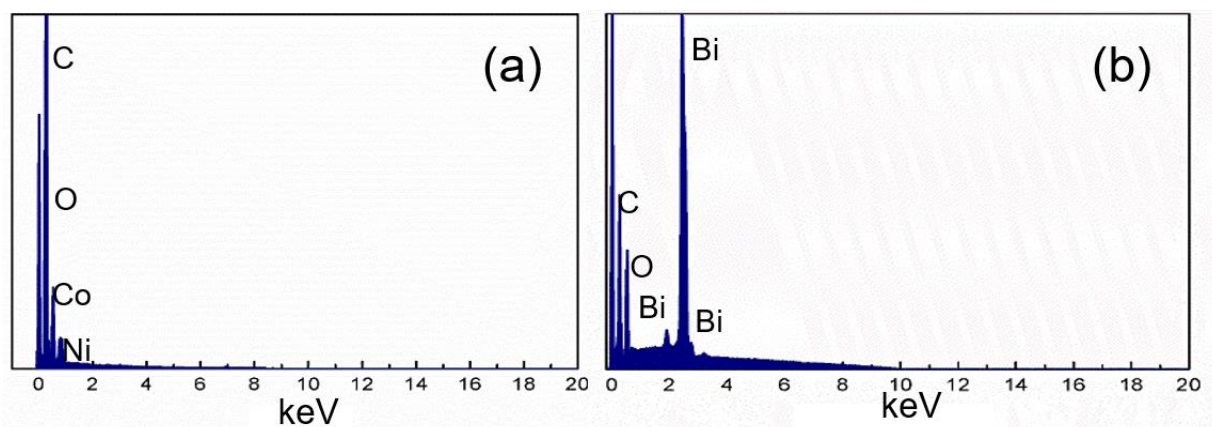


Figure S3. EDS figures of (a) CC/CNF/Ni-Co LDH, and (b) CC/CNF/Bi₂O₃.

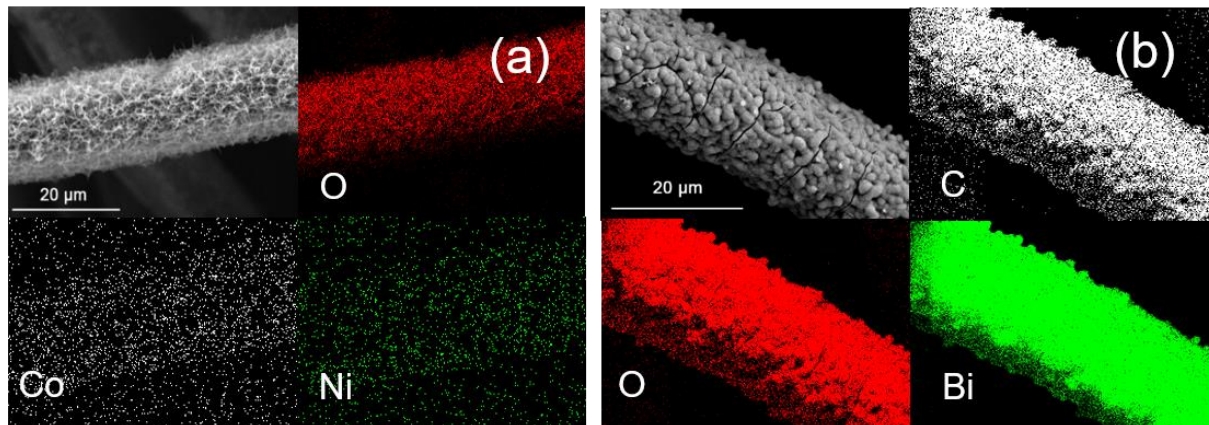


Figure S4. Mapping images of (a) CC/CNF/Ni-Co LDH, and (b) CC/CNF/Bi₂O₃.

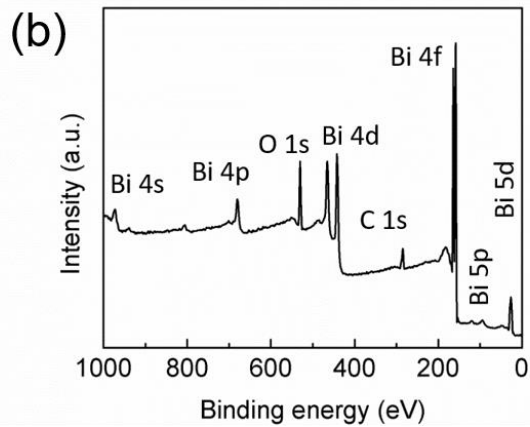
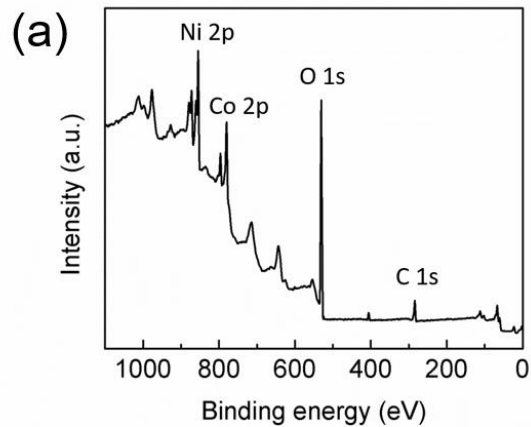


Figure S5. (a) Survey XPS of CC/CNF/Ni-Co LDH. (b) Survey XPS of CC/CNF/Bi₂O₃.

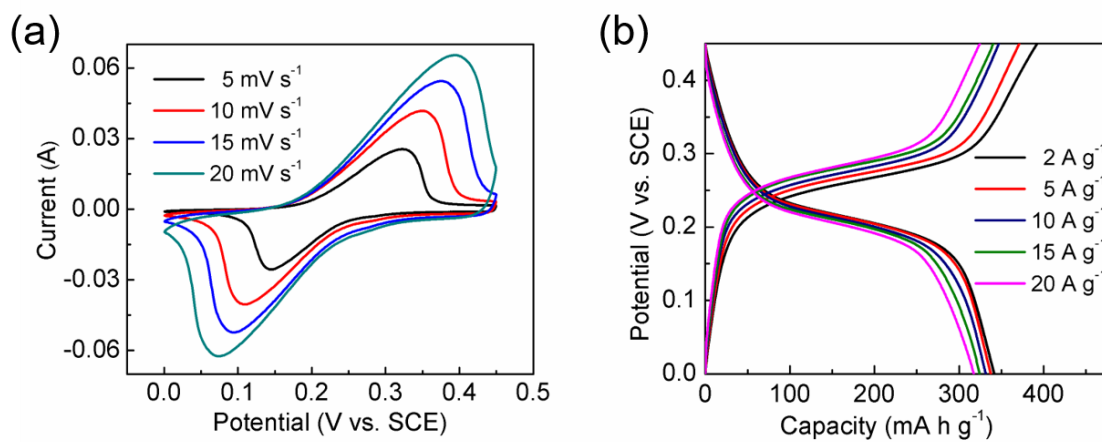


Figure S6. (a) Cyclic voltammetry curves of CC/CNF/Ni-Co LDH electrode at different scan rates. b) Galvanostatic charge/discharge curves of CC/CNF/Ni-Co LDH at different current densities.

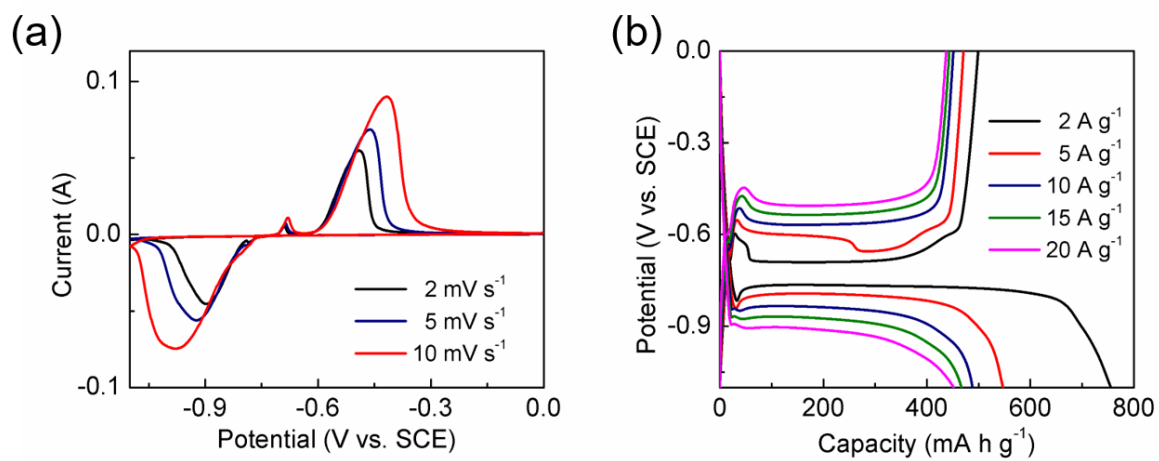


Figure S7. (a) Cyclic voltammetry curves of CC/CNF/Bi₂O₃ electrode at different scan rates. (b) Galvanostatic charge/discharge curves of CC/CNF/Bi₂O₃ at different current densities.

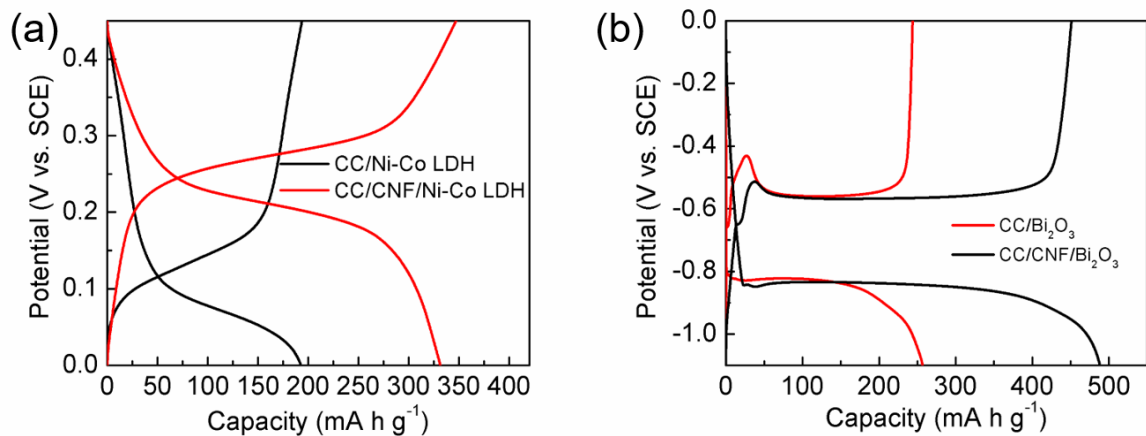


Figure S8. Galvanostatic charge/discharge curves comparison of (a) CC/Ni-Co LDH and CC/CNF/Ni-Co LDH electrode (b) CC/Bi₂O₃ and CC/CNF/Bi₂O₃ electrode in 3 M KOH at a current density of 5 A g⁻¹.