Support information

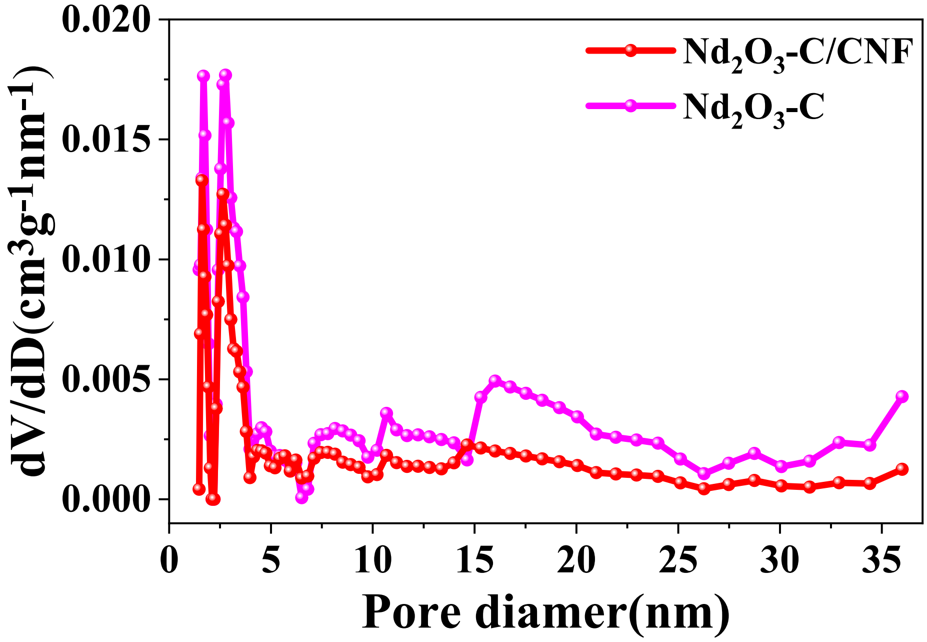

Figure S1. Aperture distribution map.

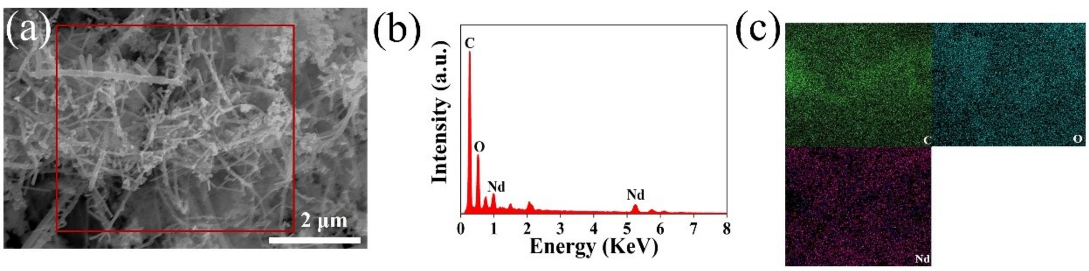

Figure S2. (a) SEM of Nd_2O_3-C/CNF; (b) EDS images of Nd_2O_3-C/CNF and (c) elemental distribution image.

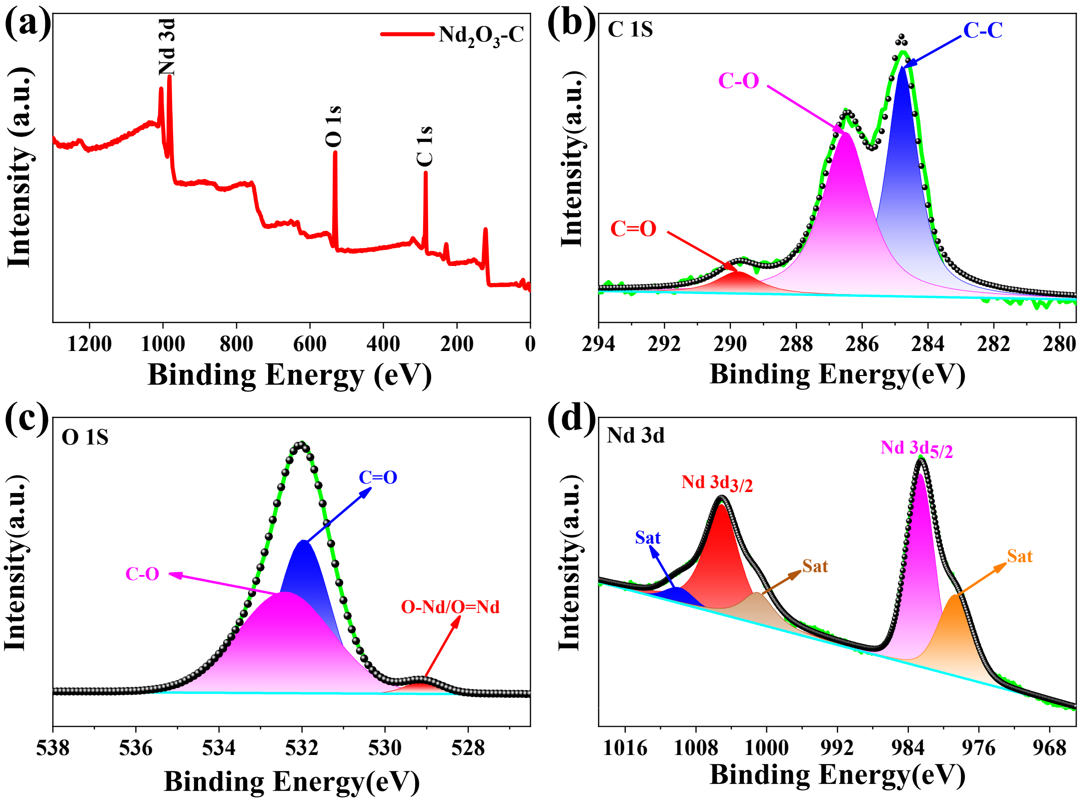

Figure S3. (a) Full spectrum of Nd_2O_3-C; Fine spectrum of the (b) C 1s orbital; (c) O 1s orbital and (d) Nd 3d orbital.

Detail of the Li_2S deposition tests conditions: We coated the prepared Nd_2O_3-C/CNF composite on carbon paper, cut it into 16 mm discs, added 20 µl of 0.5 M li_2S_8, assembled the cell and then observed the voltage change on the blue power system to find the inflection point where the voltage goes from decreasing to increasing, stopped the blue power test, and transferred the cell to an electrochemical workstation for the test of deposition experiments.

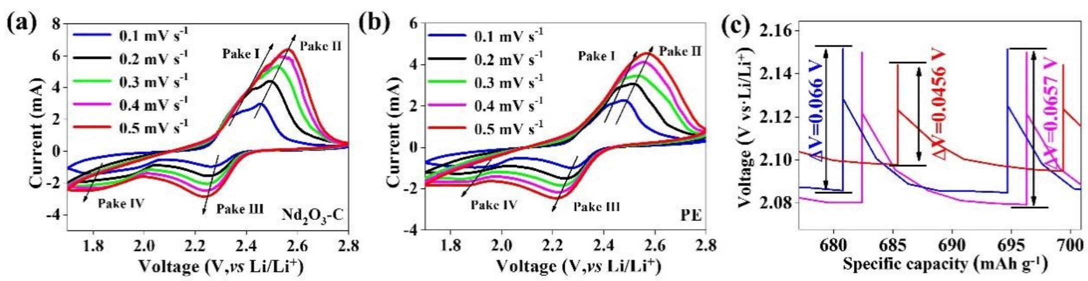

Fig. S4 CV plots at 0.1-0.5 mV s^{-1} sweep rate for (a) Nd_2O_3-C; (b) PE; (c) enlarged view of the GITT region.

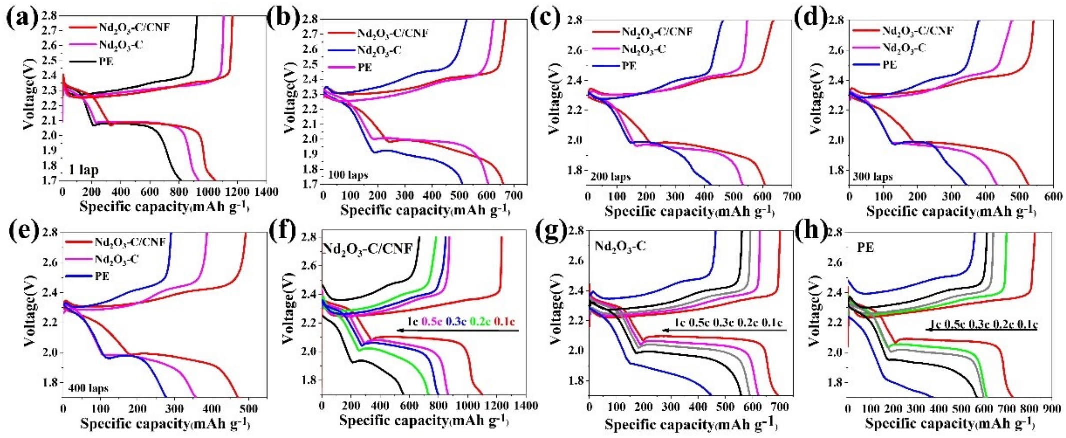

Figure S5 (a-e) Charge/discharge curves of different diaphragms under a 0.5 C cycle for 1 turn, 100 turns, 200 turns, 300 turns, and 400 turns; (f-h) Charge/discharge curves of different diaphragms under 1 C magnification.

The procedure that follows may be performed to calculate the Warburg diffusion coefficient σ_w determined by the interaction between Z_{re} and $\omega^{-0.5}$:

$$\boldsymbol{Z_{re} = R_s + R_{ct} + \sigma_w \omega^{-0.5}} \quad (1)$$

Where the charge transmission resistance is referred to by R_{ct} and the electrolyte resistance by R_s. Z_{re} and low-level $\omega^{-0.5}$ are reciprocal rectangles whose values are σ_w the curve's gradient between the roots.

$$\boldsymbol{D} = \frac{R^2T^2}{2A^2N^4F^4C^2\sigma_W^2} \quad (2)$$

Where A refers to the cathode surface area (1.13 cm^{-2}), F corresponds to the Faraday constant (9.65×10^4 C mol^{-1}), C is the molar concentration of Li^+ (about 1.1×10^{-3} mol cm^{-3}), N is the total quantity of electrons in order referring to the lithium-ion battery reaction (N=2), and R is the gas constant (8.314 J mol^{-1} K^{-1}), T represents the room temperature(298.15 K).