

Supporting Information

Nanocellulose Structured Paper-based Lithium Metal Batteries

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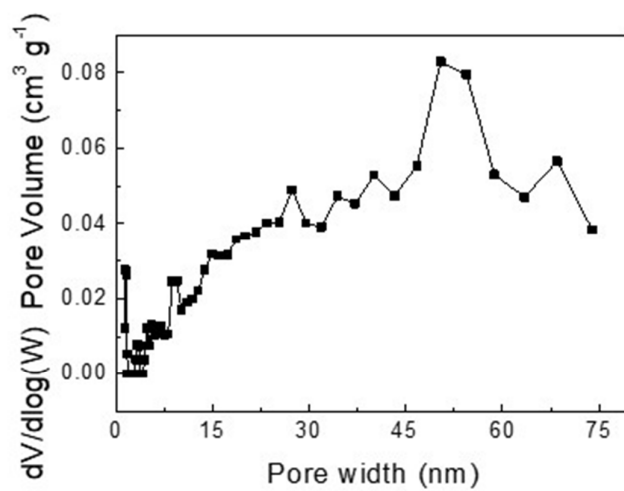


Figure S1. The pore size distribution for the CCP electrode.

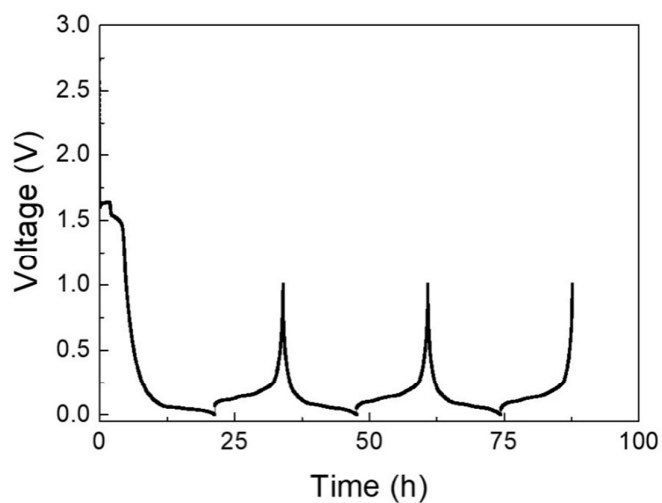


Figure S2. The cycling curves corresponding to the three-cycle pretreatment of the Li-CCP cell. This process involved a cycling of the cell at a current density of 0.125 mA cm^{-2} in a voltage window between 0.01 and 1.0 V (vs. Li^+/Li).

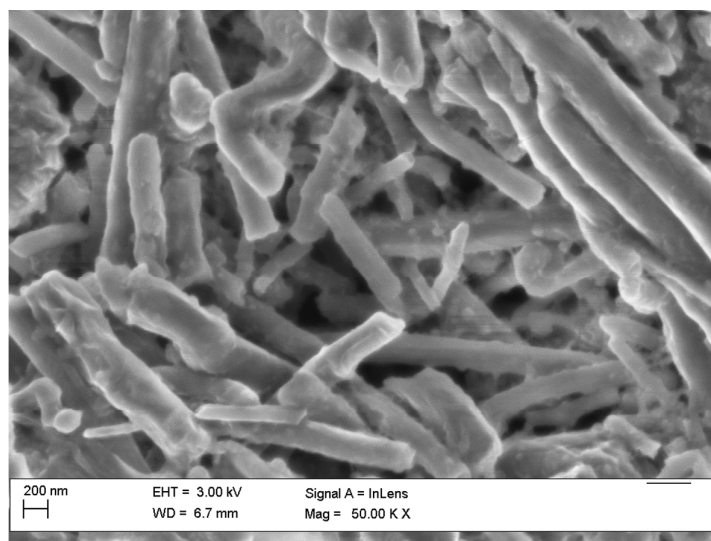


Figure S3. High resolution cross-section SEM image of the CCP electrode obtained after deposition of 8 mAh cm^{-2} Li.

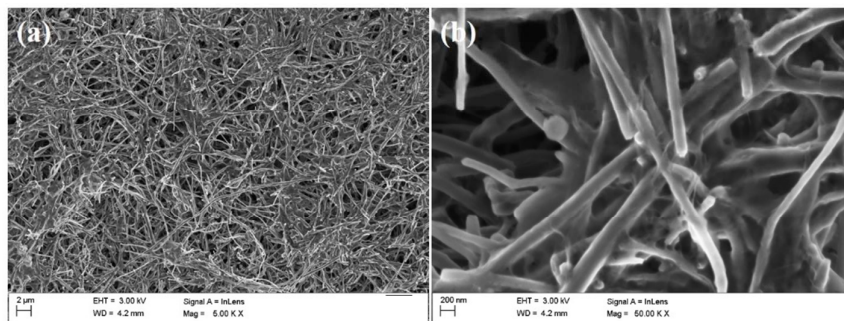


Figure S4. SEM images of the CCP electrode obtained after oxidizing the previously deposited Li coating, (a) low magnification image, (b), high magnification image.

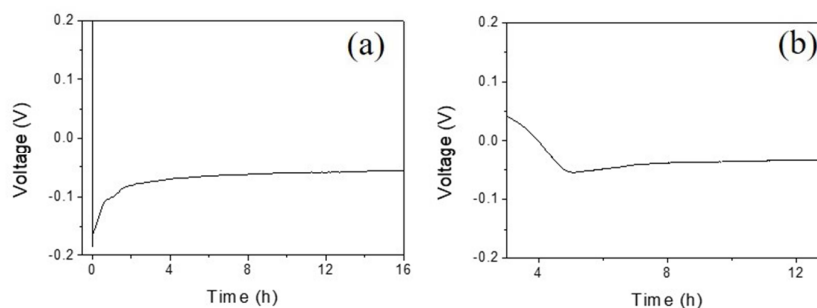


Figure S5. The potential as a function of the time during Li deposition on a (a) Cu and (b) CCP electrode versus the Li counter/reference electrode using a current density of 0.5 mA cm^{-2} . The shape of the chronopotentiogram for the Cu electrode indicates the presence of a nucleation overpotential whereas the positive potential seen initially for the CCP electrode may be explained by underpotential deposition as explained in the main text.

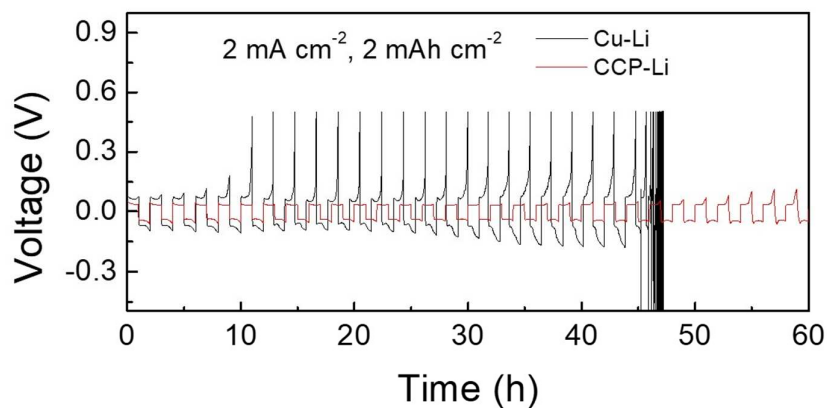


Figure S6. The cell voltage as a function of time for repeated Li metal deposition and oxidation using a fixed charge of 2 mAh cm^{-2} and a current density of 2 mA cm^{-2} for the Li-Cu|Li and Li-CCP|Li cells, respectively. For the Li-CCP or Li-Cu electrode, lithium metal was first pre-plated using a charge of 6 mAh cm^{-2} at a current density of 0.5 mA cm^{-2} .

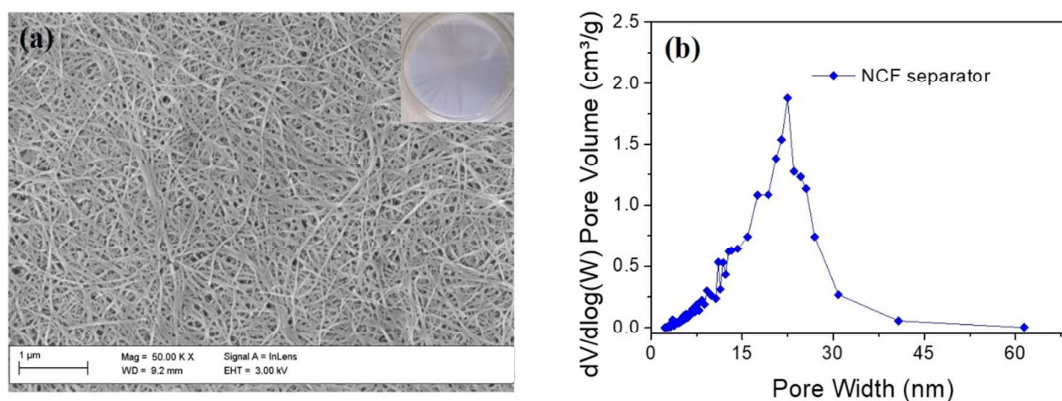


Figure S7. (a) SEM image of the NCF separator with a photo of the NCF separator as an inset. (b) The pore size distribution for the NCF separator.

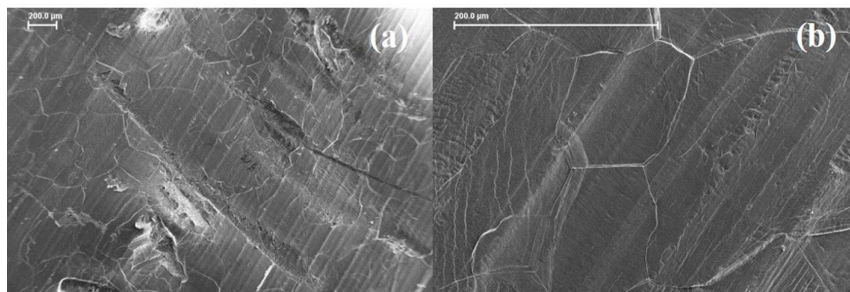


Figure S8. SEM images of the pristine Li metal foil. The image in a) was recorded with a lower degree of magnification than that used in the b) image.

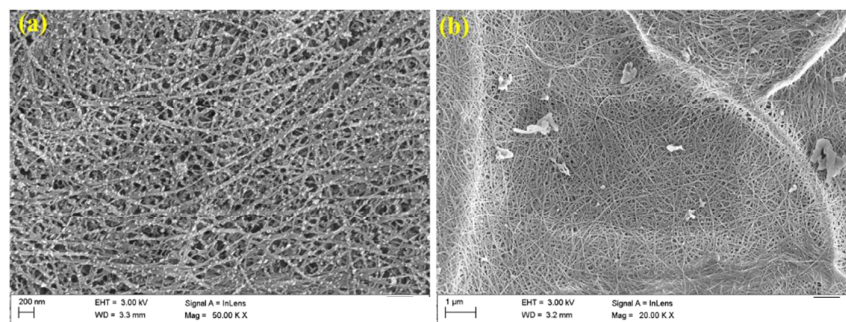


Figure S9. SEM images ((a) high magnification and (b) low magnification) depicting a NCF separator recovered from a NCF-based Li|Li cell after 300 cycles at 0.5 mA cm^{-2} , 1 mAh cm^{-2} in a LP 40 electrolyte.

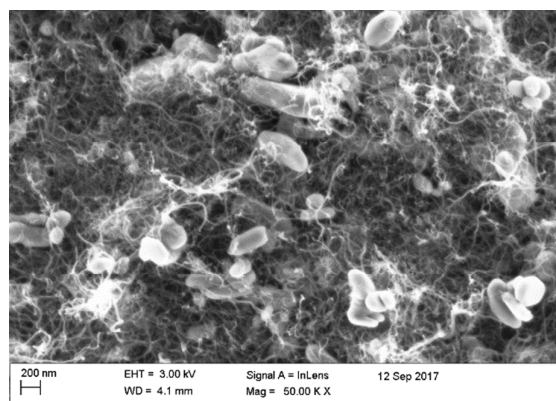


Figure S10. High resolution SEM image of LFP paper cathode.

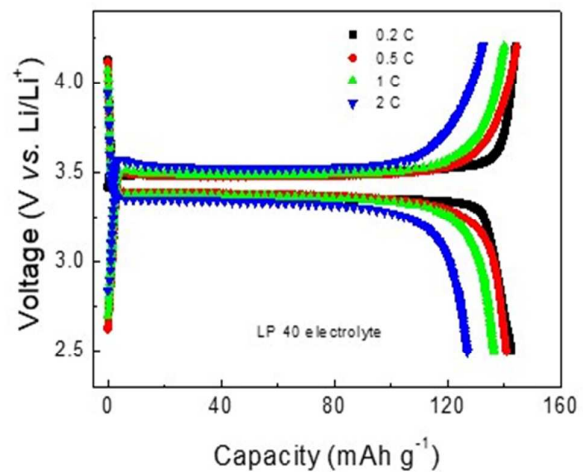


Figure S11. Galvanostatic voltage profiles recorded for different cycling rates using a Li/LFP cell containing a PE separator and a LP 40 electrolyte.

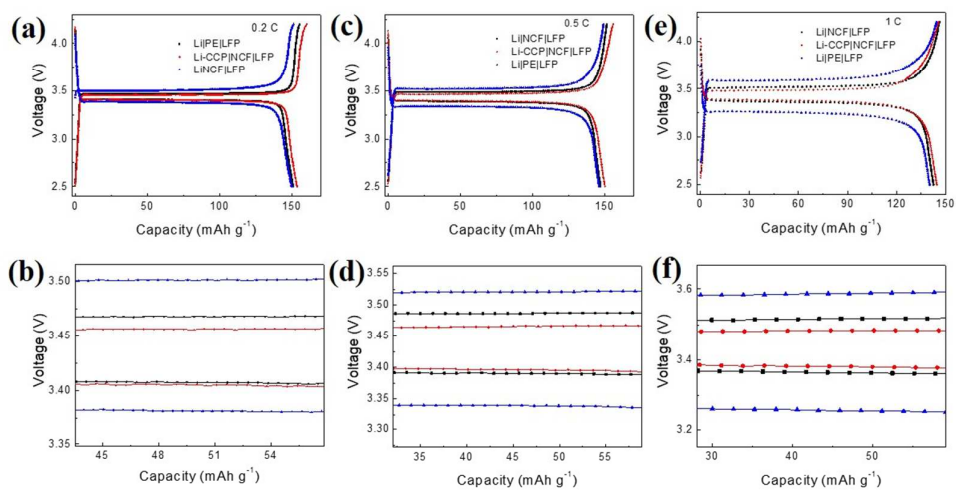


Figure S12. Galvanostatic voltage profiles for different full cells obtained at a rate of (a, b) 0.2 C, (c, d) 0.5 C and (e, f) 1 C, respectively. The differences between the charge and discharge voltages are more clearly seen in the (b, d and f) figures which show magnifications of the plateau regions for the different full cells.