## **Energy Materials**

- 1 Supplementary Material: Constructing stable lithium metal anodes with a
- 2 high-Mn<sup>3+</sup>/Mn<sup>4+</sup>-ratio lithium adsorbent
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5 **Supplementary Figure 1.** N<sub>2</sub> adsorption isotherm of HMOs from BET measurements.

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- 11 Supplementary Figure 3. Top-view SEM images of (A) HMO-3, (B) HMO-5 and (C)
- 12 HMO-7 layers. Cross-sectional SEM images of (D) HMO-3, (E) HMO-5 and (F)
- 13 HMO-7 layers.



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15 Supplementary Figure 4. Cross-sectional SEM images of the (A) HMO-3 and (B)

16 HMO-7 coated separators after Li electroplating of 2 and 4 mAh cm $^{-2}$ .





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19 Supplementary Figure 5. SEM images of the bottom side of the (A) HMO-3, (B)

20 HMO-5 and (C) HMO-7 coated separators after a Li electroplating of 4 mAh cm<sup>-2</sup>.

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23 Supplementary Figure 6. Top-view SEM images of Li deposits on the
24 HMO-coated-Cu electrodes after a Li electroplating of 2 mAh cm<sup>-2</sup>.

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27 Supplementary Figure 7. Nyquist plots of EIS data recorded upon cycling of Li||Cu

- half cells using (A) bare, (B) HMO-3, (C) HMO-5 and (D) HMO-7-coated Cu 28 electrodes. The cycling was carried out under 1 mA cm<sup>-2</sup> – 1 mAh cm<sup>-2</sup>.
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Supplementary Figure 8. SEM images of the cycled (A) bare, (B) HMO-3, (C) 32

- HMO-5 and (D) HMO-7-coated Cu electrodes, after a cycling of 50 cycles under 1 mA 33
- $cm^{-2} 1 mAh cm^{-2}$ . 34
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Supplementary Figure 9. SEM images of the cycled (A) bare, (B) HMO-3, (C) 37 HMO-5 and (D) HMO-7-coated Cu electrodes, after a cycling of 100 cycles under 1 38 mA cm<sup>-2</sup> – 1 mAh cm<sup>-2</sup>. 39





42 **Supplementary Figure 10.** Voltage profiles of Li||Li symmetrical cells with/without



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46 Supplementary Figure 11. Cell configuration of the Li||NCM811 pouch cell, with
47 photos of the (A) anode side, (B) cathode side and (C) sealed cell. The initial capacity
48 of the assembled pouch cell is ~65 mAh.







52 Supplementary Figure 12. Charge-discharge curves of the Li||NCM811 pouch cells

