

## Supplementary Information

### **The enhanced Jahn-Teller distortion boosts molybdenum trioxide superior lithium ion storage capability**

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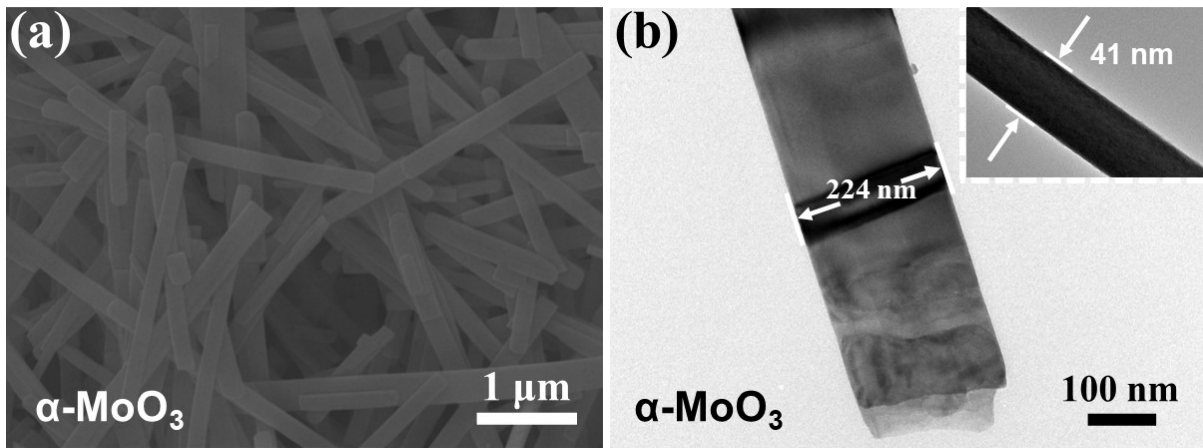


Fig. S1. (a) SEM and (b) TEM images of  $\alpha\text{-MoO}_3$ . Inset: the side view of  $\alpha\text{-MoO}_3$  nanobelt.

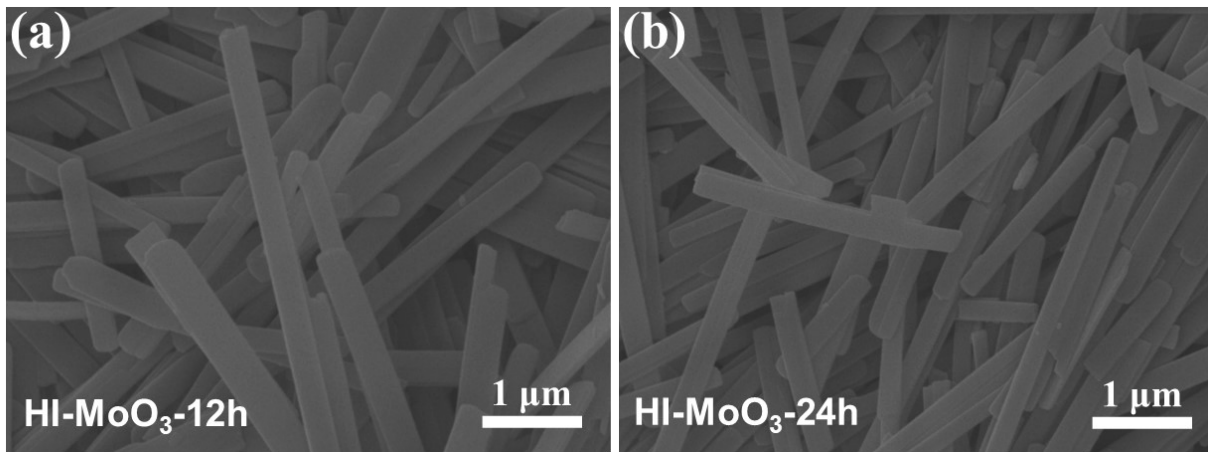


Fig. S2. SEM images of (a)  $\text{HI-MoO}_3\text{-12h}$  and (b)  $\text{HI-MoO}_3\text{-24h}$ .

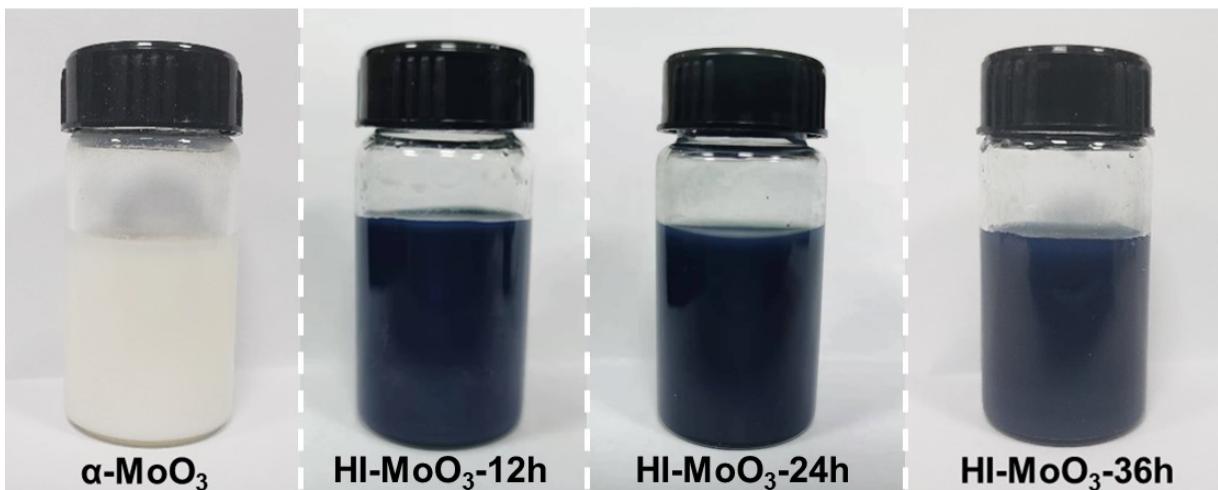


Fig. S3. Optical photographs of  $\alpha\text{-MoO}_3$ ,  $\text{HI-MoO}_3\text{-12h}$ ,  $\text{HI-MoO}_3\text{-24h}$ , and  $\text{HI-MoO}_3\text{-36h}$ .

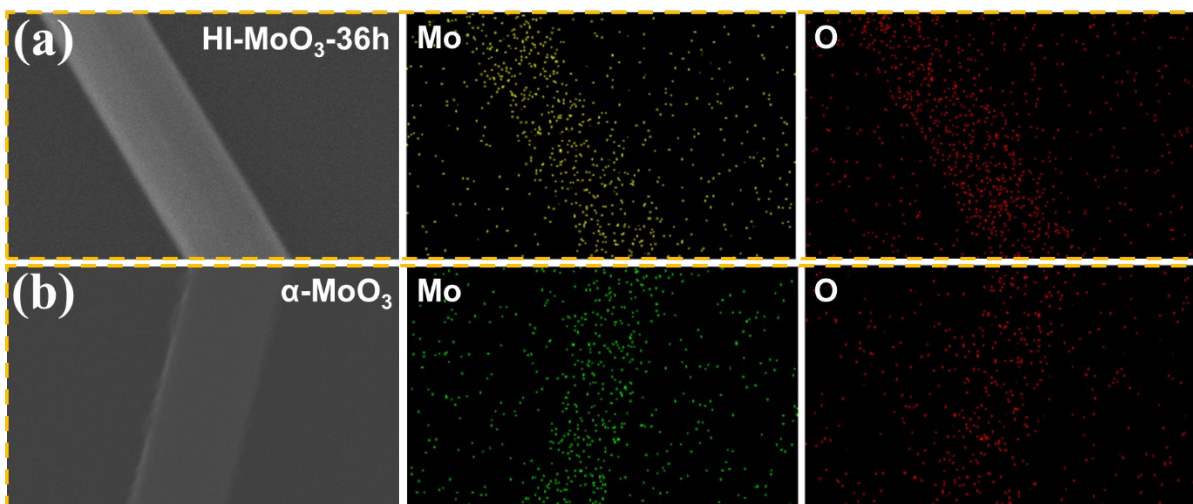


Fig. S4. EDS results of  $\alpha$ - $\text{MoO}_3$  and HI- $\text{MoO}_3$ -36h.

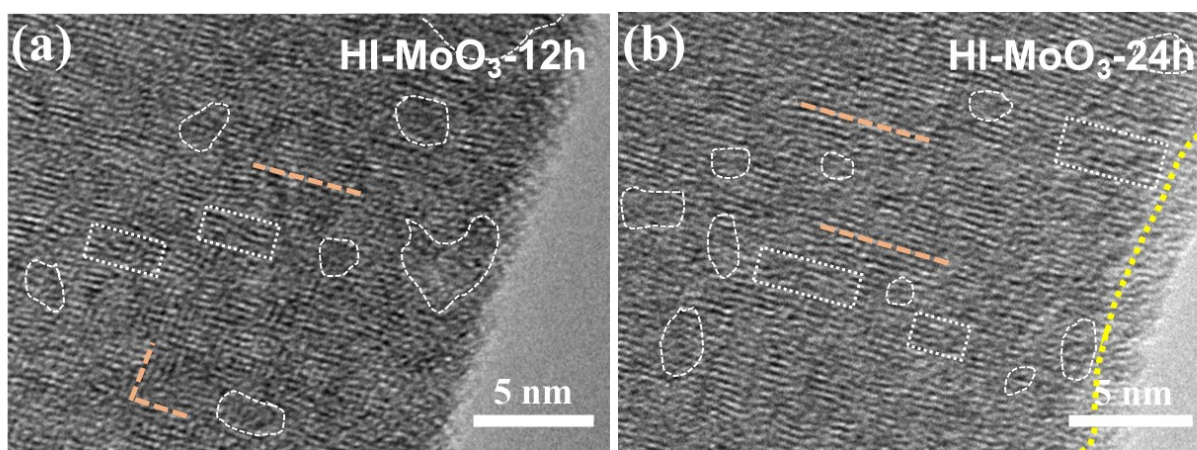


Fig. S5. HRTEM images of (a) HI- $\text{MoO}_3$ -12h and (b) HI- $\text{MoO}_3$ -24h.

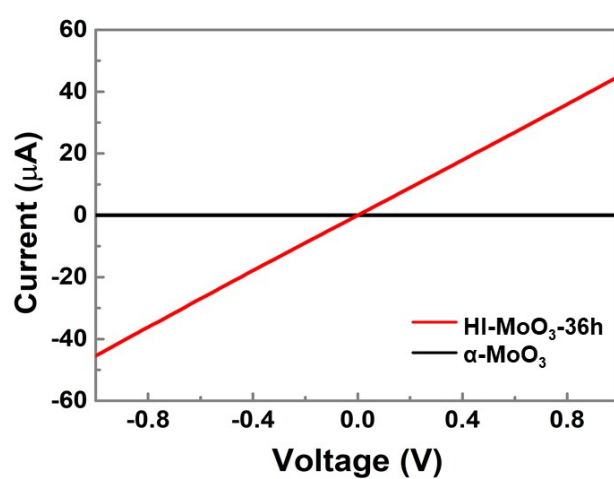


Fig. S6.  $I$ - $V$  curves of  $\alpha$ - $\text{MoO}_3$  nanobelts and HI- $\text{MoO}_3$ -36h.

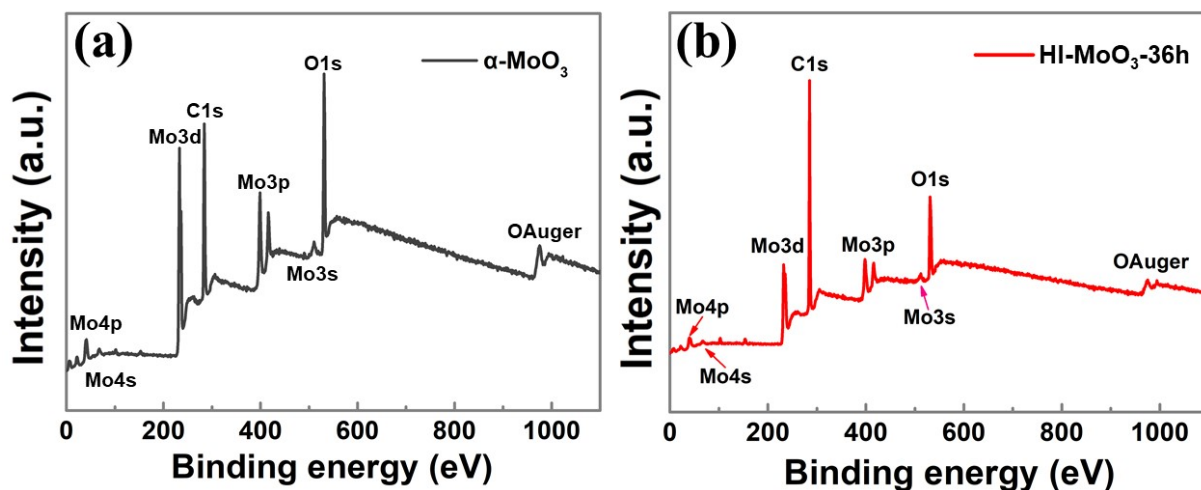


Fig. S7. XPS full spectra of  $\alpha$ - $\text{MoO}_3$  and HI- $\text{MoO}_3$ -36h.

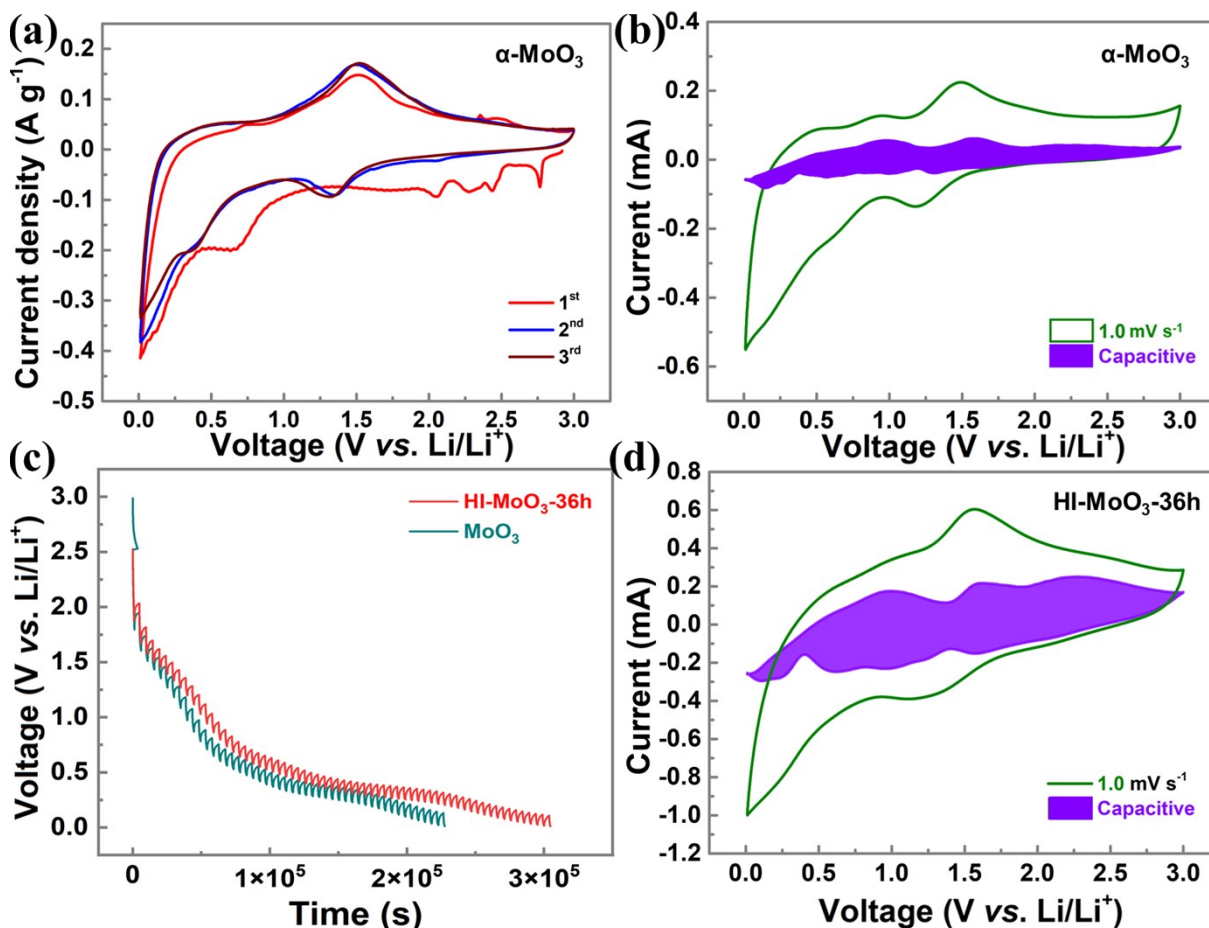
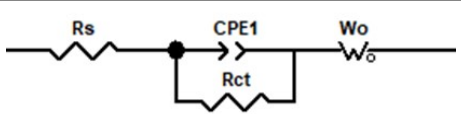


Fig. S8. (a) CV curves of first three cycles of  $\alpha$ - $\text{MoO}_3$ . (b) The capacitive contribution in  $\alpha$ - $\text{MoO}_3$  at  $1.0 \text{ mV s}^{-1}$ . (c) The GITT discharge curves of  $\alpha$ - $\text{MoO}_3$  and HI- $\text{MoO}_3$ -36h. (d) The contribution to capacitive charge storage in HI- $\text{MoO}_3$ -36h at  $1.0 \text{ mV s}^{-1}$ .

	$R_s$ (before cycling)	$R_{ct}$ (before cycling)	$R_s$ (after cycling)	$R_{ct}$ (after cycling)
MoO <sub>3</sub>	19.9 $\Omega$	850.0 $\Omega$	10.6 $\Omega$	95.6 $\Omega$
HI-MoO <sub>3</sub> -36h	8.2 $\Omega$	241.0 $\Omega$	5.3 $\Omega$	72.9 $\Omega$

**Table S1.** The equivalent circuit model, the fitted overall resistance of the cell components ( $R_s$ ) and the fitted charge transfer resistance ( $R_{ct}$ ) of MoO<sub>3</sub>//Li and HI-MoO<sub>3</sub>-36h//Li batteries (before and after cycling 100 times at 0.1 A g<sup>-1</sup>).