Supporting Information

A High-Energy-Density Aqueous Zinc-Manganese Battery with a La-Ca Co-Doped ε-MnO_2 Cathode

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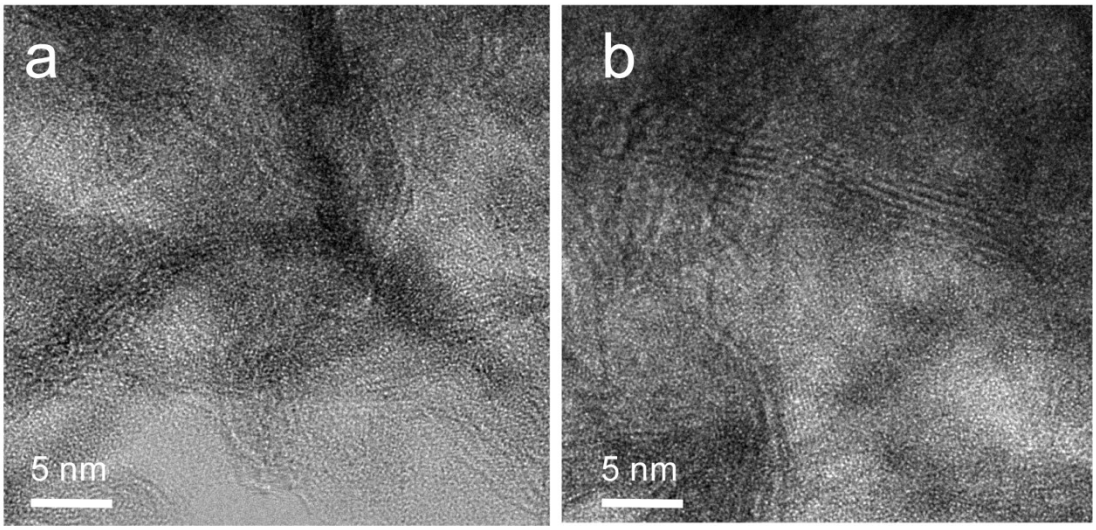

Fig. S1 HRTEM images of (a) MO and (b) LCMO.

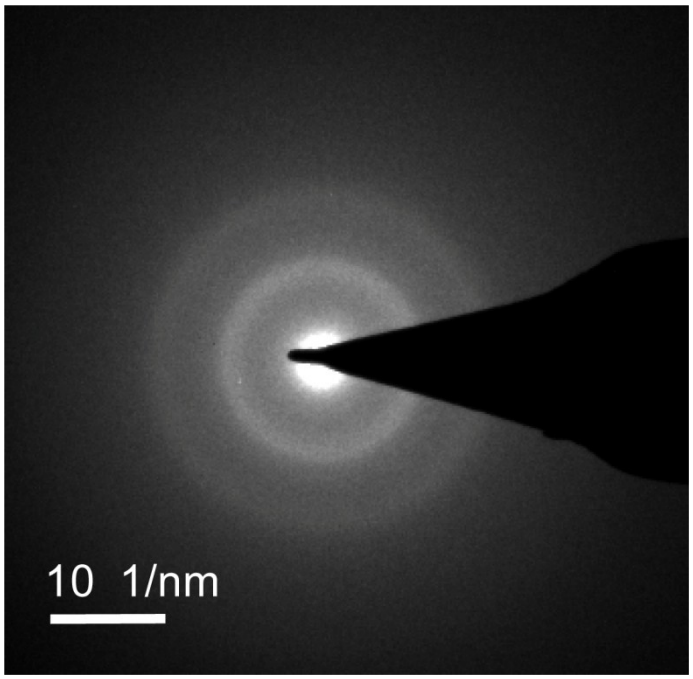

Fig. S2 SAED pattern of MO sample.

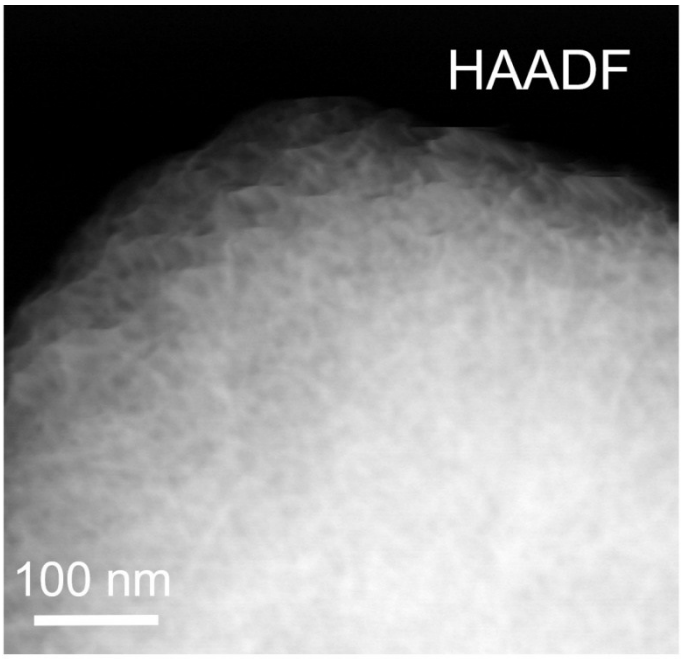

Fig. S3 High-angle annular dark field (HAADF) image of the LCMO sample.

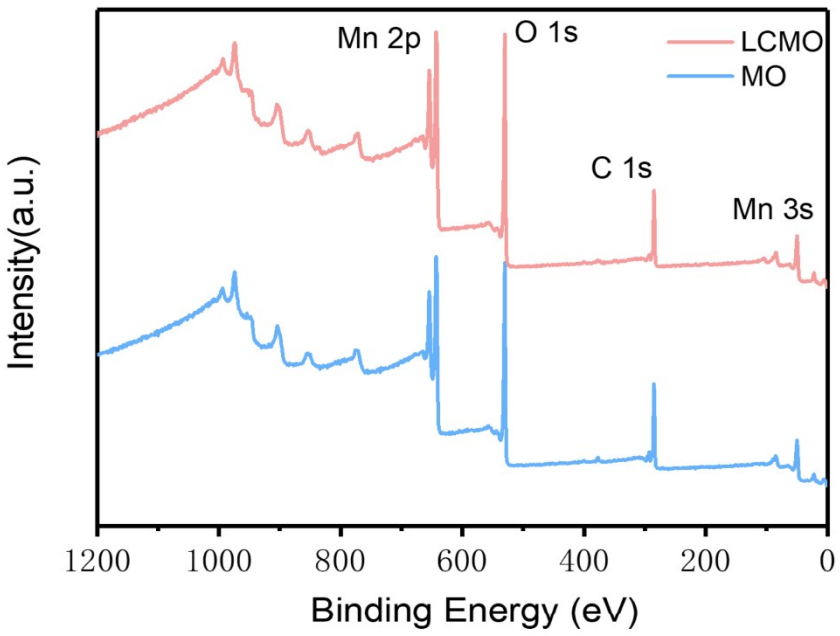

Fig. S4 XPS survey spectra of MO and LCMO.

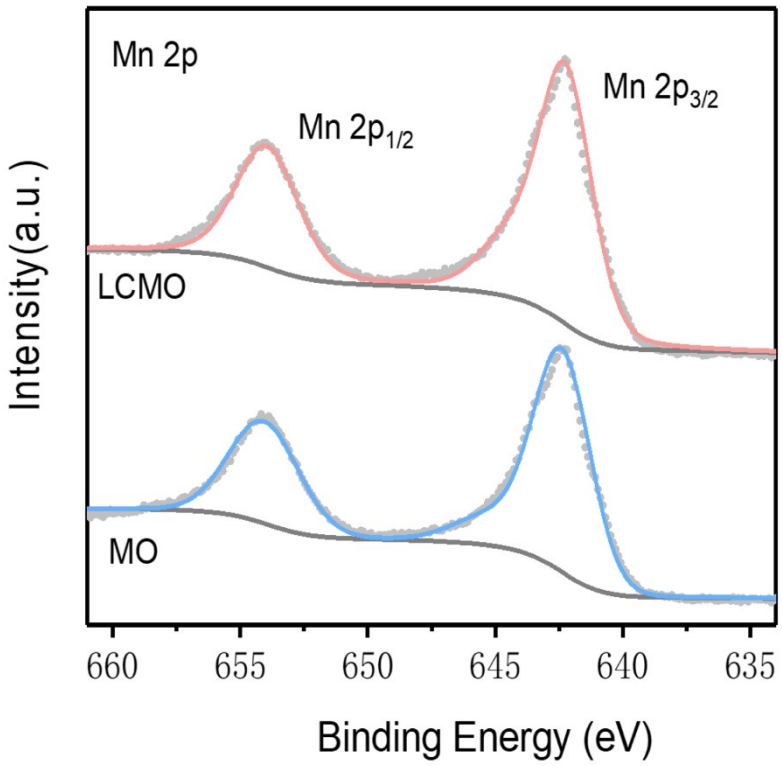

Fig. S5 XPS Mn 2p spectra of MO and LCMO.

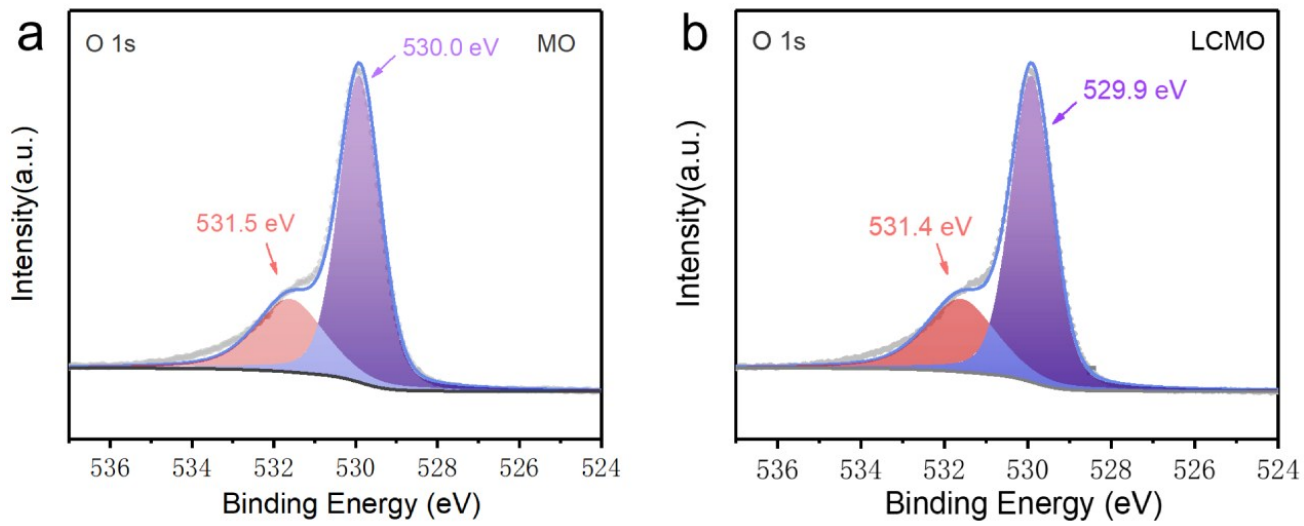

Fig. S6 XPS O1s spectra of (a) MO and (b) LCMO.

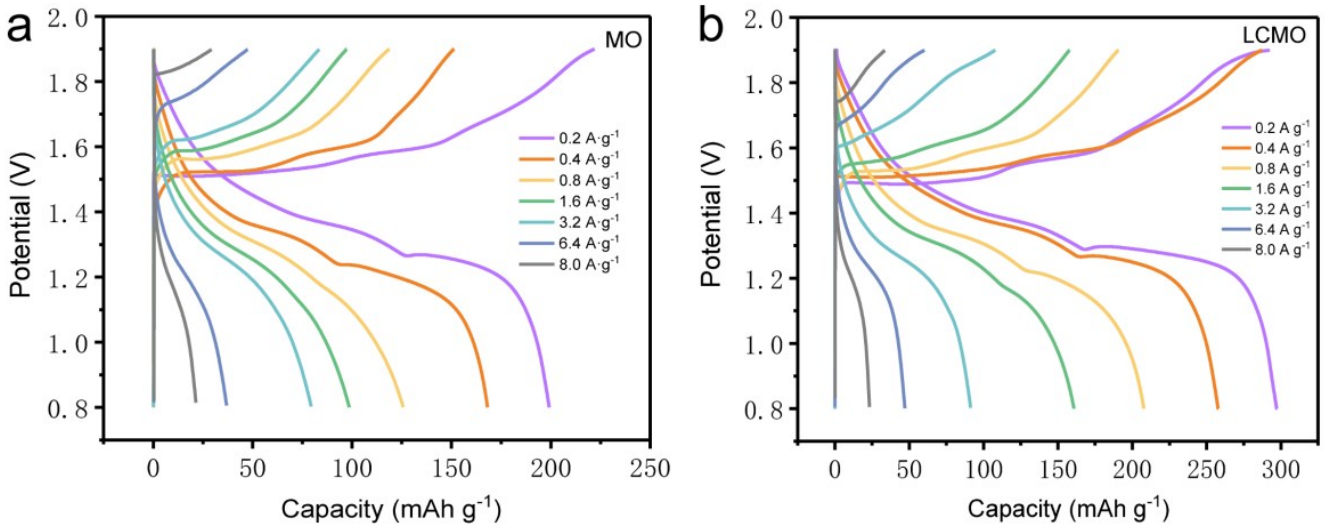

Fig. S7 GCD curves of (a) MO and (b) LCMO at different current densities.

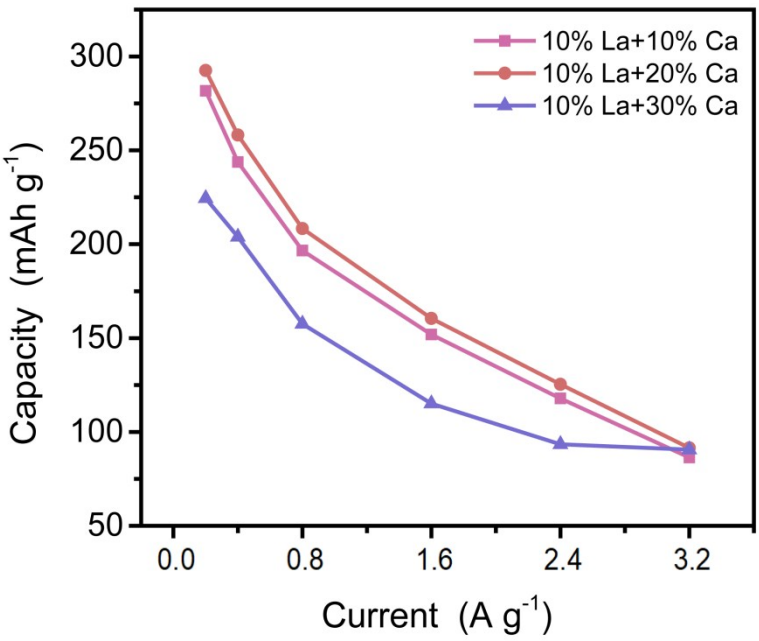

Fig. S8 Capacities of ε-MnO_2 cathodes with different La and Ca proportion collocated at 0.2 A g^{-1}. All the samples are synthesized by simply adjusting the addition ratio in the precursor solution. The mole percentages of La and Ca additions are calculated based on the theoretical mole yield of MnO_2, which means the number of moles of MnO_2 is set to be 100%. For example, 5 mmol $MnSO_4 \cdot H_2O$, 1.67 mmol $CaCl_2$ and 0.83 mmol $La(NO_3)_3 \cdot 6H_2O$ were dissolved into 150 mL H_2O to obtain precursor solution of the 10% La + 20% Ca sample.

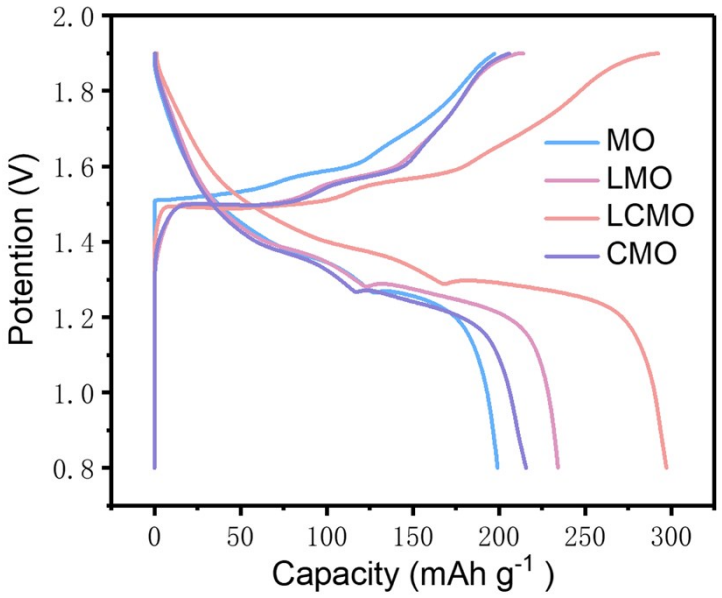

Fig. S9 GCD curves of MO, CMO. LMO and LCMO ar 0.2 A g^{-1}.

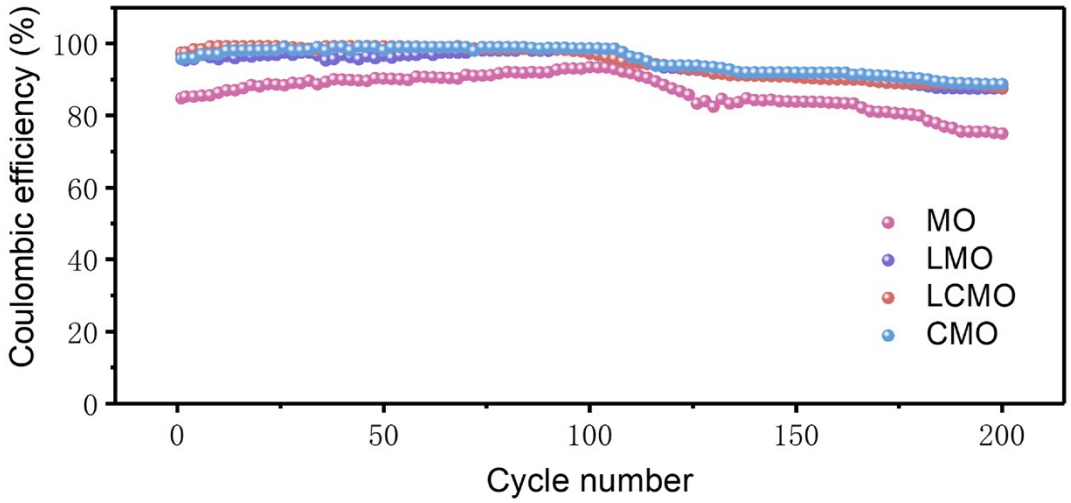

Fig. S10. Coulombic efficiency of the MO, LMO, CMO and LCMO electrodes calculated from cycling performance.

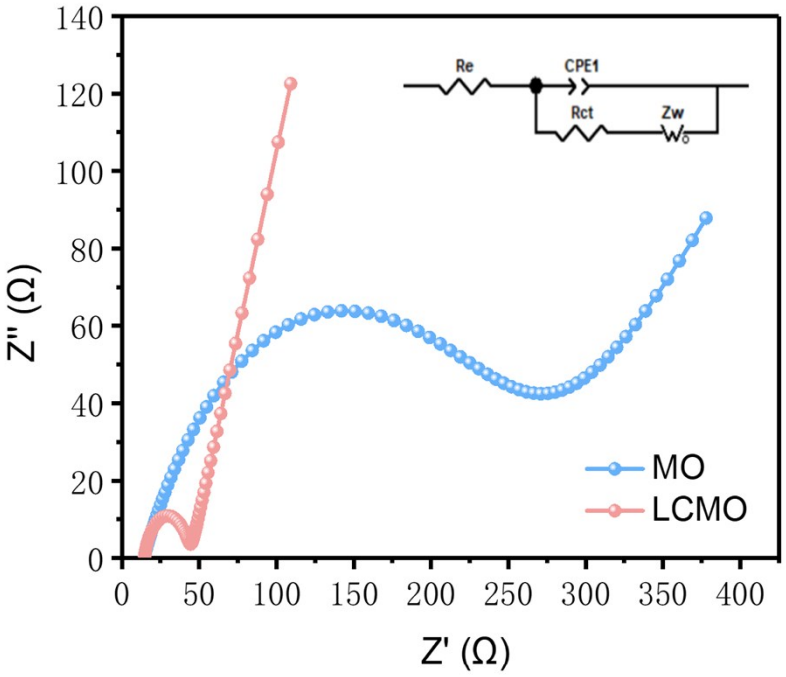

Fig. S11. Fitting curves of Nyquist plots of MO and LCMO cathodes.

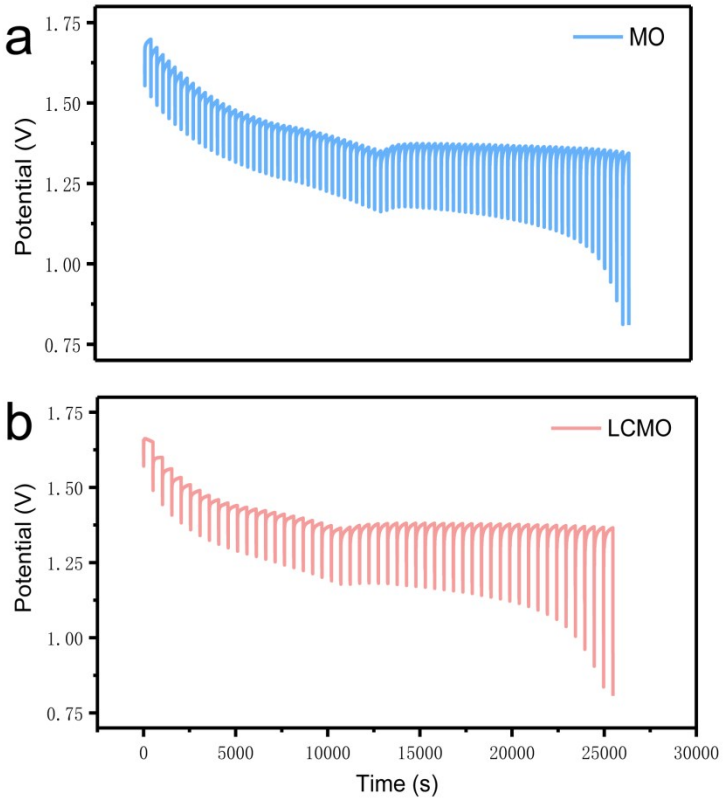

Fig. S12 GITT tests of (a) MO and (b) LCMO.

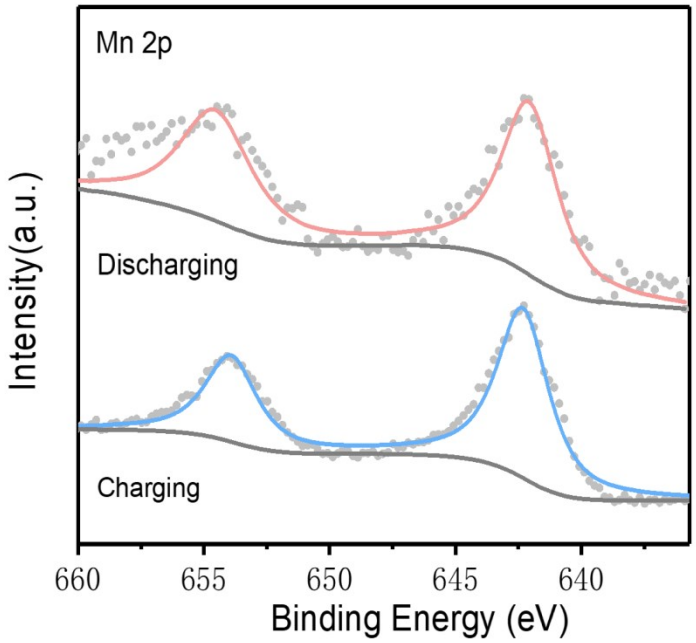

Fig. S13 XPS Mn 2p spectra of LCMO in charging and discharging state.

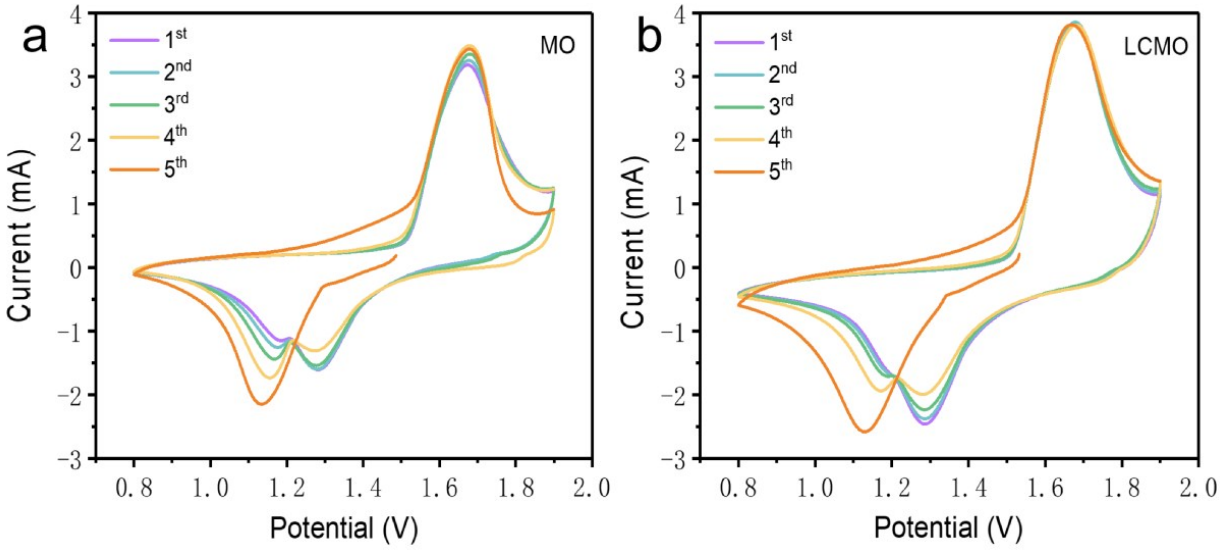

Fig. S14 First five CV curves of the MO and LCMO electrode at the scan rate of 1 mV s^{-1}.