

Supporting Information

Solvent-Controlled Charge Storage Mechanisms of Spinel Oxide Electrodes in Mg Organohaloaluminate Electrolytes

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EXPERIMENTAL SECTION

Energetics of the interaction between Mg cations and Mn₃O₄ host. DFT calculations were performed with the Vienna Ab initio Simulation Package (VASP).¹⁻⁵ The total energies were calculated by using PBEsol exchange-correlation functional.⁶ The projector augmented wave (PAW) method⁷ was used with the Mg_pv (2s²2p⁶), Mn_pv (3p⁶, 3d⁵, 4s²), O (2s², 2p⁴) and Li (2s¹) potentials supplied with VASP. Electron wave functions were expanded in plane waves up to a cut-off energy of 550 eV and the SCF convergence energy was set to 10⁻⁷ eV. The tetrahedron method with Blöchl correction was used for the electronic energy level occupancy. Brillouin zone integration was done with a 7×7×5 Γ-centered k-point mesh for the Mn₃O₄, MgMn₃O₄ and LiMn₃O₄ unit cells, with a similar k-point density for supercells. A Hubbard U of U = 4 eV was applied to Mn 3d state to correct self-interaction errors.⁸ (The calculated magnetic moments of Mn²⁺ and Mn³⁺ were 4.5 μ_B and 3.4 μ_B, respectively.)

Geometry optimization was done by full relaxation of the structure until the Hellmann-Feynman forces on the ions were smaller than 10⁻³ eV Å⁻¹. For the defect structures, the ions were allowed to relax while keeping the lattice vectors fixed. Transition state searches were done with a 2×1×1 supercell using the climbing-image nudged elastic band (cNEB)⁹ method as implemented in VASP. In the cNEB calculations, nine images were initialized by linear interpolation between the relaxed initial and final states. For all images along the band, atomic positions were relaxed until the Hellmann-Feynman forces on the ions converged to below 0.05 eV Å⁻¹ with fixed lattice vectors. Due to convergence issues, a Hubbard U was not used in cNEB calculations.¹⁰ Only the nearest neighbor ions to the migrating Li or Mg were allowed to relax during cNEB calculations.

Preparation of APC electrolytes. In accordance with the procedure proposed by Aurbach *et al.*,¹¹ the APC-THF (tetrahydrofuran, Aldrich, anhydrous) electrolyte was prepared by the intensive mixing of the PhMgCl-THF solution (PhMgCl in THF, Aldrich, 99%) and the AlCl₃ (AlCl₃, Aldrich, 99.999%)-THF solution with a molar ratio of 2:1 under stirring for one day. The electrolyte preparation was performed in an Ar-filled glove box (<0.1 ppm of water and oxygen) and the concentration of the electrolyte was 0.4 mol L⁻¹.

The APC-G4 (tetruglyme, Aldrich, 99+) electrolyte and the APC-DME (1,2-dimethoxyethane, Alfa Aesar, 99+) electrolyte were obtained by first placing the synthesized APC-THF electrolyte under vacuum at room temperature overnight to fully evaporate the THF solvent. Then, introducing the necessary amount of G4 solvent or DME solvent into the obtained white precipitate and stirring overnight.

Material Characterization. The magnesiated Mn₃O₄ nanoparticles in APC electrolytes were characterized by a double Cs corrected coldFEG JEOL ARM200CF, operated at 200 kV and equipped with a large solid angle (0.98 srad) Centurio EDS detector and a Quantum ER GIF for EELS. Spectroscopy was performed in scanning transmission electron microscopy (STEM) mode. EDS and dual EELS maps were always acquired simultaneously. For the core loss EEL spectra (O K and Mn L_{2,3} peaks) the low loss spectra, that included the zero loss peak, were used to calibrate the energy scale in every pixel of the map.

Electrochemical Measurements. Mn₃O₄ nanoparticles have been synthesized according to a procedure presented in our previous work,¹² and nano-scaled crystalline particles with diameter of ~10 nm (see Figure S3) were obtained. The electrodes were prepared by mixing the obtained Mn₃O₄ powders with Super-P carbon black (Imerys) and polyvinylidene difluoride (PVDF, Kynar, reagent grade) in a 8:1:1 weight ratio in the presence of N-methyl pyrrolidinone (NMP, Aldrich, >99%). Then, the electrode film was formed by tape casting the mixed slurry onto different current collectors (graphite foil (Gif), Cu foil (Cuf), Ni foil (Nif) and stainless steel foil (SSf)), followed by vacuum drying at 120 °C for 10 hours. The dried film was punched into discs with 16 mm diameter and ~0.6 mg mass loading per disc. Coin cells (2016) with a Mg counter electrode (which was polished with SiC paper and cleaned before using) were used for the studies of the electrochemical performances of the synthesized Mn₃O₄ electrodes in APC electrolytes. The measurements of the galvanostatic charge/discharge were conducted using a Maccor 4200 (Maccor Inc., USA) battery analyzer at ambient temperature. By using the coin cell configuration, the electrochemical impedance spectra (EIS) were obtained on a Gamry Reference 600 instrument (Pennsylvania, USA) and fitted by using ZView software. The input AC perturbation was 5 mV, and the applied frequencies ranged from 0.01 Hz to 10 kHz. Cyclic voltammetry (CV) measurements of the Mn₃O₄ electrodes were carried out on the Gamry instrument by using a 3-electrode cell (EL-CELL), where the Mg metal served as both the reference electrode and the counter electrode.

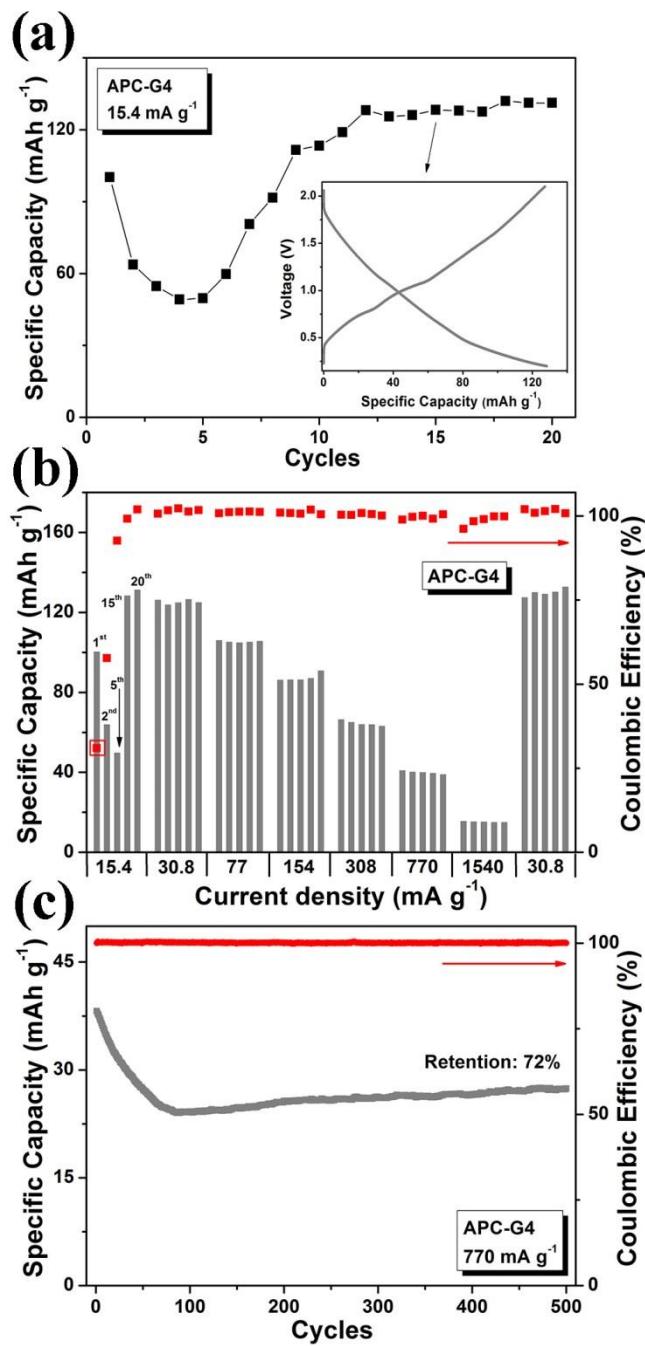


Figure S1. Electrochemical charge storage performance of the Mn_3O_4 cathode in APC-G4 electrolyte. (a) Cyclic stability at 15.4 mA g^{-1} . (b) Rate cyclic performance. (c) Long-term cycling at 770 mA g^{-1} . Inset: galvanostatic charge/discharge profiles at 15.4 mA g^{-1} .

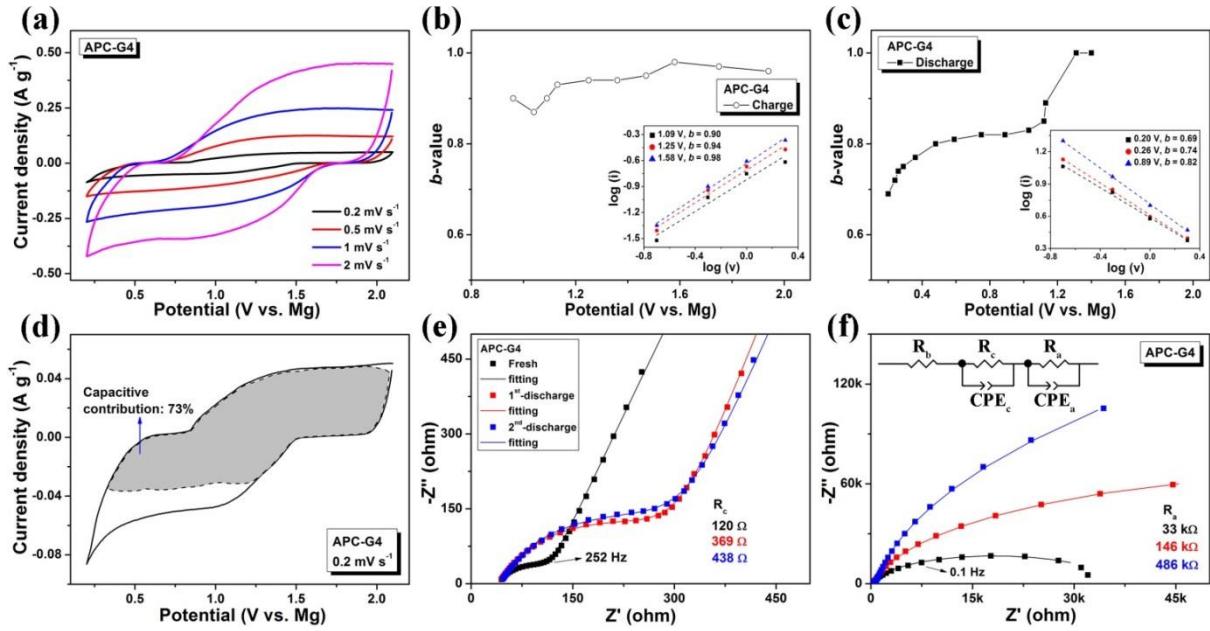


Figure S2. Kinetics, quantitative and impedance analysis of the Mn_3O_4 cathodes in APC-G4 electrolyte. (a) CV curves at different scan rates. Dependence of *b*-values as a function of potential for (b) anodic sweeps and (c) cathodic sweeps, respectively. Insets: power law dependence of current as a function of sweep rate. (d) The capacitive contribution (which corresponds to the shaded region, and determined from the data in Figure S3a) to the total stored charge at 0.2 mV s⁻¹. (e) The high frequency region and (f) the whole frequency region of the Nyquist plots of the Mn_3O_4 electrodes at different cell states under 15.4 mA g⁻¹. Inset: equivalent circuits used for data fitting.

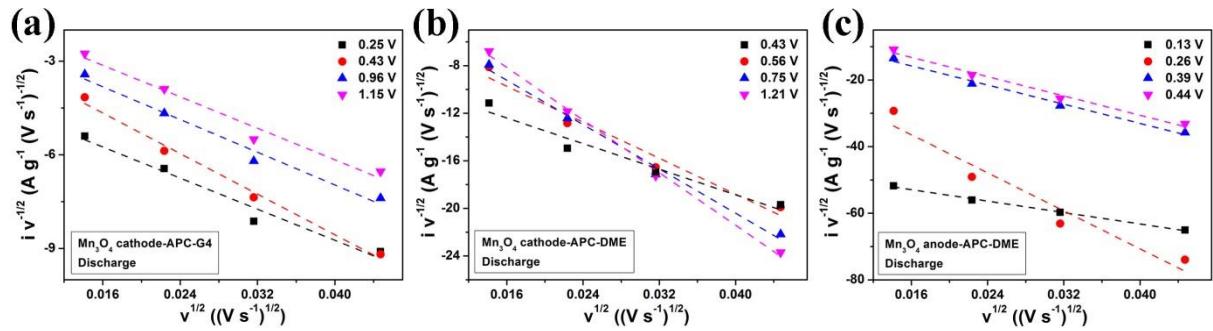


Figure S3. The plots of $v^{1/2}$ versus $i v^{-1/2}$. The scan rates are varied from 0.2 to 2 mV s⁻¹.

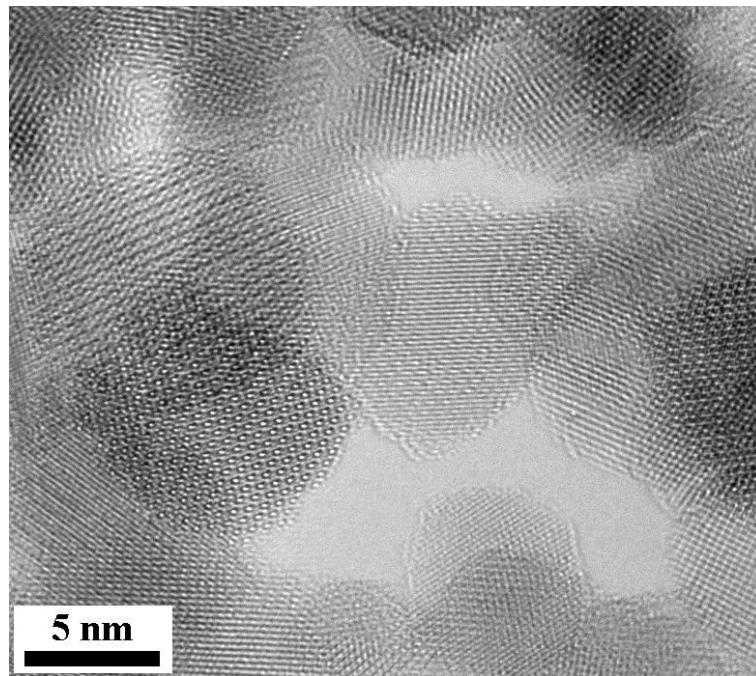


Figure S4. TEM image of the pristine Mn_3O_4 electrode.

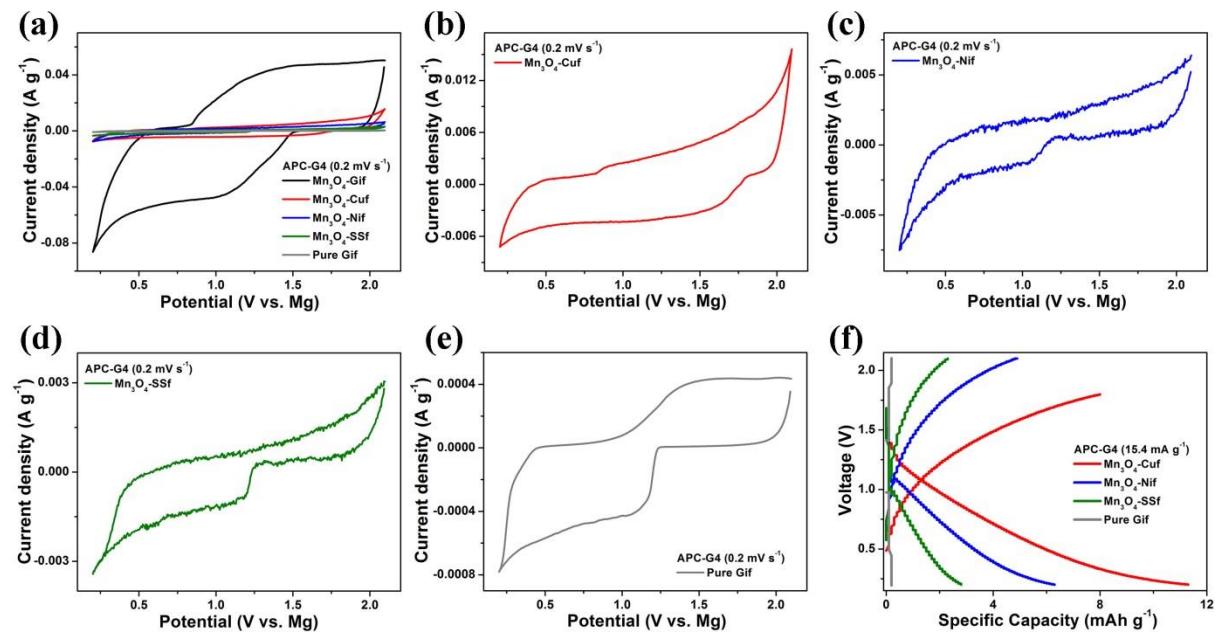


Figure S5. (a) Comparison of CV curves at 0.2 mV s^{-1} in APC-G4 electrolyte. CV curves of (b) $\text{Mn}_3\text{O}_4\text{-Cuf}$, (c) $\text{Mn}_3\text{O}_4\text{-Nif}$, (d) $\text{Mn}_3\text{O}_4\text{-SSf}$ and (e) pure Gif at 0.2 mV s^{-1} in APC-G4 electrolyte. (e) Galvanostatic charge/discharge profiles at 15.4 mA g^{-1} in APC-G4 electrolyte.

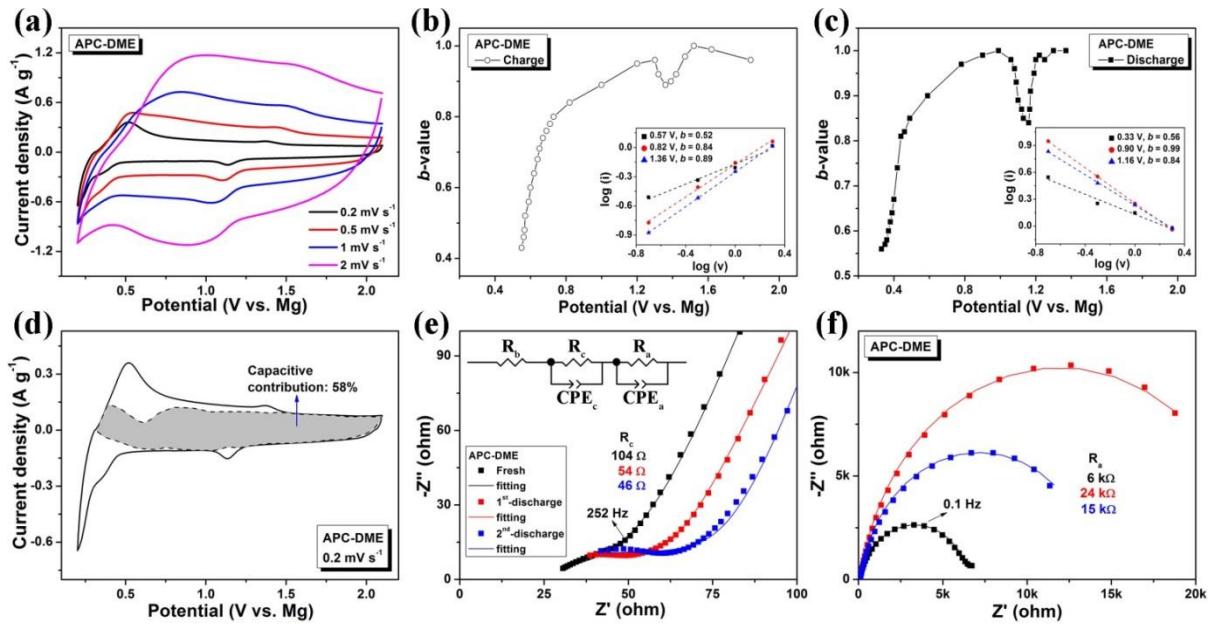


Figure S6. Kinetics, quantitative and impedance analysis of the Mn_3O_4 cathode in APC-DME electrolyte. (a) CV curves at different scan rates. Dependence of b -values as a function of potential for (b) anodic sweeps and (c) cathodic sweeps. Insets: power law dependence of current as a function of sweep rate. (d) The capacitive contribution (corresponding to the shaded region, and is determined from the data in Figure S3b) to the total stored charge at 0.2 mV s⁻¹. (e) The high-frequency region and (f) the whole frequency region of the Nyquist plots of the Mn_3O_4 electrodes at different cell states under 15.4 mA g⁻¹. Inset: equivalent circuits used for data fitting.

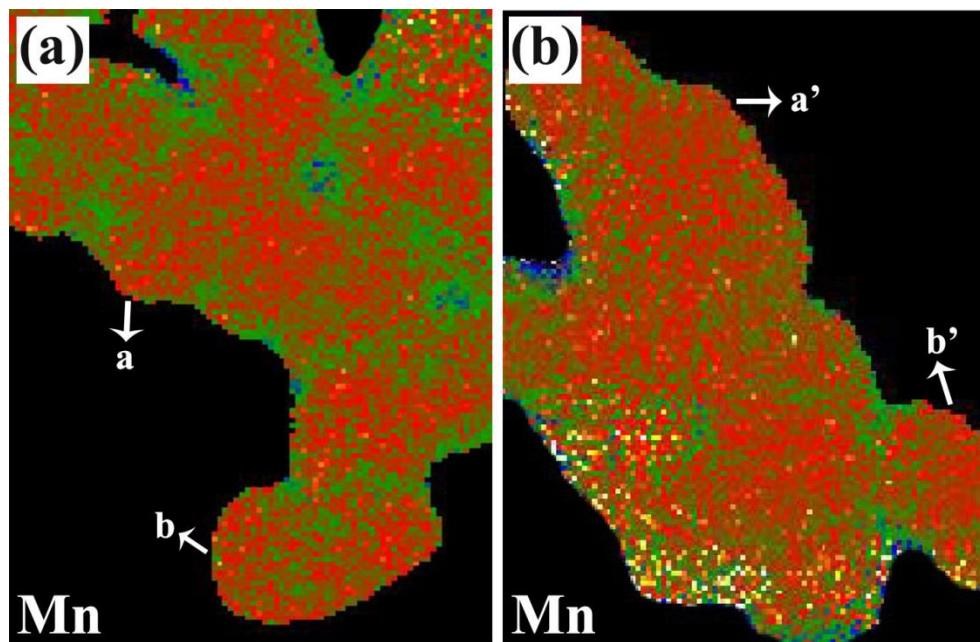


Figure S7. (a,b) The relative concentrations of Mn after quantification of EEL spectrum image that correspond to the STEM images shown in Figure 4a and 4d, respectively.

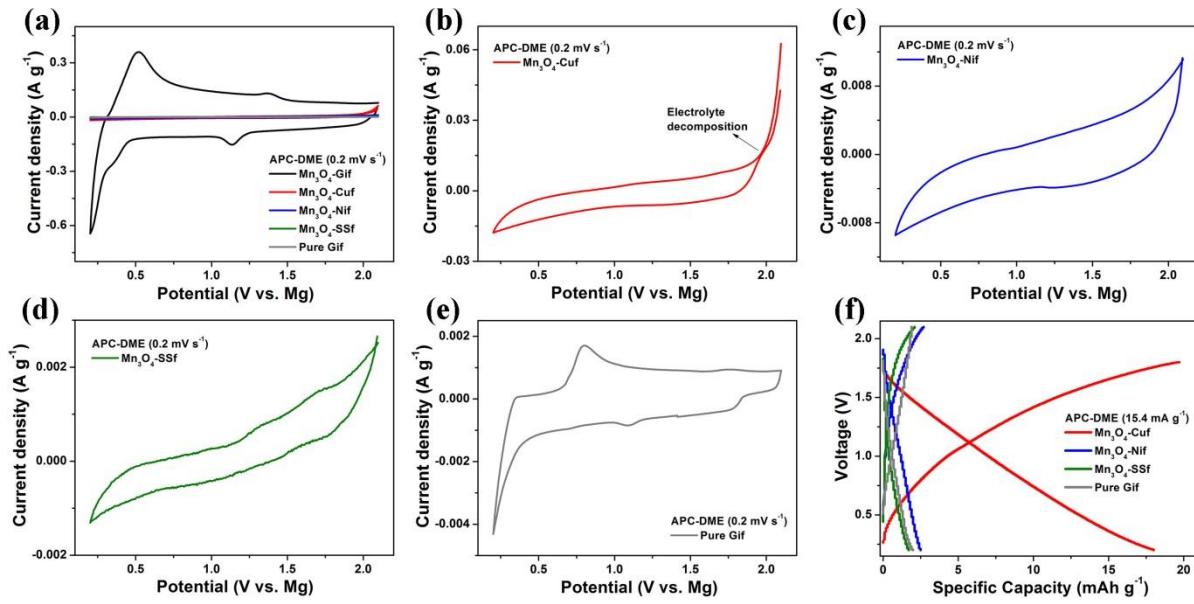


Figure S8. (a) Comparison of CV curves at 0.2 mV s^{-1} in APC-DME electrolyte. CV curves of (b) Mn_3O_4 -Cuf, (c) Mn_3O_4 -Nif, (d) Mn_3O_4 -SSF and (e) pure Gif at 0.2 mV s^{-1} in APC-DME electrolyte. (e) Galvanostatic charge/discharge profiles at 15.4 mA g^{-1} in APC-DME electrolyte.

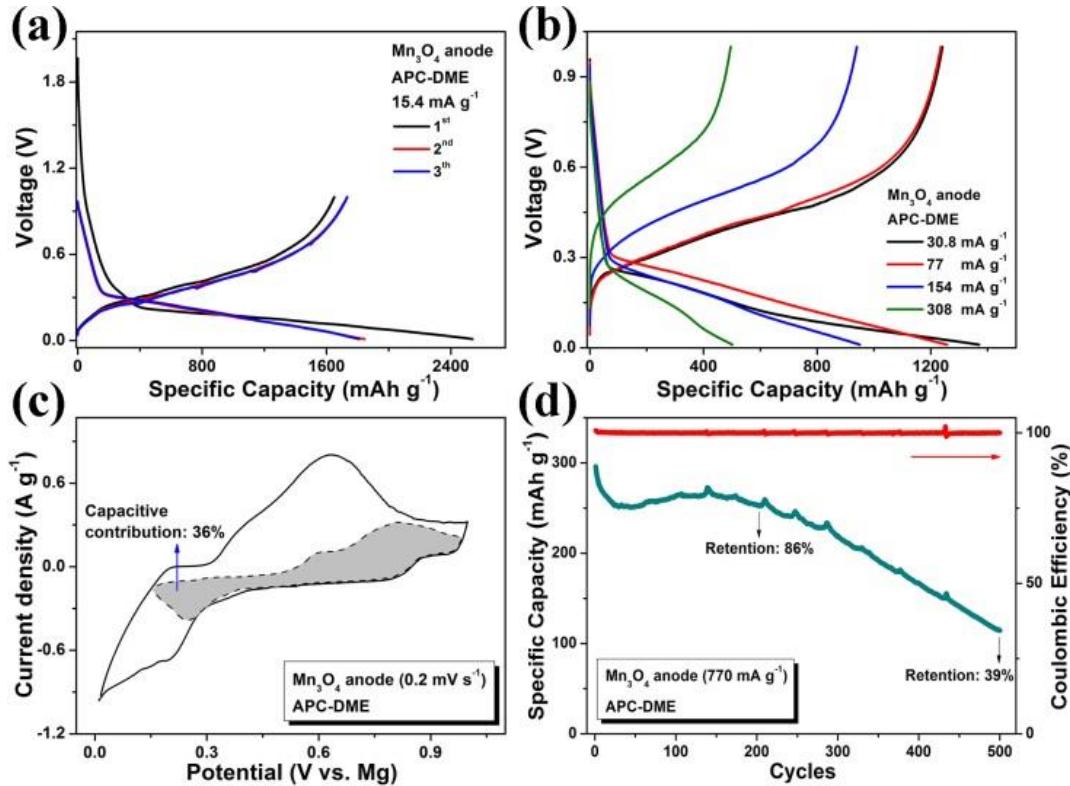


Figure S9. Electrochemical charge storage performance and quantitative analysis of the Mn_3O_4 anode in APC-DME electrolyte. (a,b) Galvanostatic charge/discharge profiles at different current densities. (c) The capacitive contribution (which corresponds to the shaded region, and determined from the data in Figure S3c) to the total stored charge at 0.2 mV s^{-1} . (d) Long cycle life at 770 mA g^{-1} .

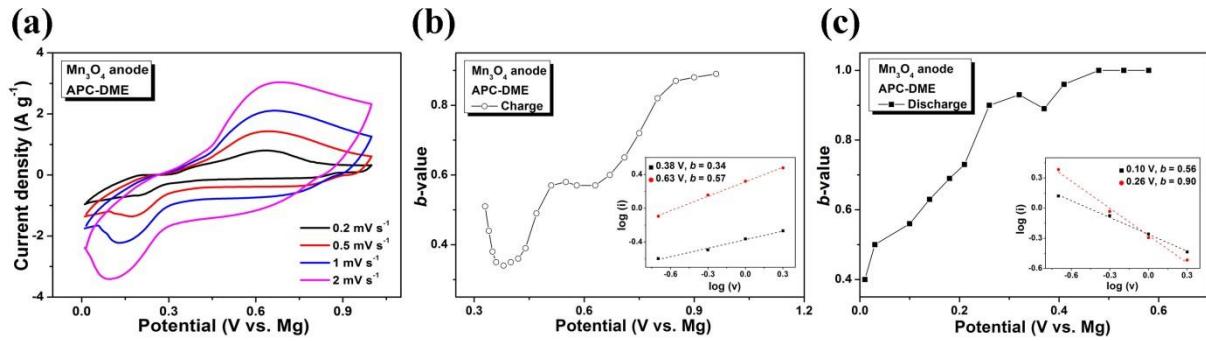


Figure S10. (a) CV curves of the Mn₃O₄ anode at different scan rates in APC-DME electrolyte. Dependence of *b*-values as a function of potential for (b) anodic sweeps and (c) cathodic sweeps. Insets show the power law dependence of current as a function of sweep rate.

Table S1 A survey of electrochemical performance of cathodes in Mg battery

Cathode materials	^a Initial discharge capacity	Cycling stability	Rate capability	Ref (year)
Metal oxides				
Mn ₃ O ₄	790 mAh g ⁻¹ at 15.4 mA g ⁻¹	100% after 500 cycles at 770 mA g ⁻¹	70 mAh g ⁻¹ at 1.5 A g ⁻¹	This work
MnO ₂	~150 mAh g ⁻¹ at 500 mA g ⁻¹	~33% after 160 cycles at 500 mA g ⁻¹	-	13
MnO ₂	~160 mAh g ⁻¹ at 985.6 mA g ⁻¹	~67% after 200 cycles at 985.6 mA g ⁻¹	-	14
<i>α</i> -MnO ₂	~280 mAh g ⁻¹ at 36 μA cm ⁻²	~25% after 6 cycles at 36 μA cm ⁻²	-	15
<i>λ</i> -MnO ₂	~330 mAh g ⁻¹ at 60 mA g ⁻¹	57% after 5 cycles at 60 mA g ⁻¹	-	16
Birnessite MnO ₂	~230 mAh g ⁻¹ at 100 mA g ⁻¹	~62% after 1000 cycles at 2 A g ⁻¹	~100 mAh g ⁻¹ at 2 A g ⁻¹	17
Mn ₂ O ₄	150 mAh g ⁻¹ at 13.5 mA g ⁻¹	-	-	18
V ₂ O ₅	180 mAh g ⁻¹ at 0.15 mV s ⁻¹	~83% after 15 cycles at 0.15 mV s ⁻¹	-	19
V ₂ O ₅	~220 mAh g ⁻¹ at 40 mA g ⁻¹	~58% after 100 cycles at 320 mA g ⁻¹	~100 mAh g ⁻¹ at 640 mA g ⁻¹	20
V ₂ O ₅ ·nH ₂ O	~25 mAh g ⁻¹ at 20 μA cm ⁻²	50 mAh g ⁻¹ after 10 cycles at 20 μA cm ⁻²	-	21

VO_x	218 mAh g ⁻¹ at 60 mA g ⁻¹	~70% after 20 cycles at 60 mA g ⁻¹	-	22
VO_x	124 mAh g ⁻¹ at 60 mA g ⁻¹	50% after 80 cycles at 60 mA g ⁻¹	-	23
$\text{V}_2\text{O}_5/\text{graphene}$	~320 mAh g ⁻¹ at 50 mA g ⁻¹	~81% after 200 cycles at 1 A g ⁻¹	100 mAh g ⁻¹ at 2 A g ⁻¹	24
^b GO/ V_2O_5	178 mAh g ⁻¹ at 38.8 mA g ⁻¹	~71% after 20 cycles at 38.8 mA g ⁻¹	-	25
$\text{V}_2\text{O}_5/\text{CNF}$	~150 mAh g ⁻¹ at 20 mA g ⁻¹	~125 mAh g ⁻¹ after 50 cycles at 37.5 mA g ⁻¹	~100 mAh g ⁻¹ at 37.5 mA g ⁻¹	26
$\text{V}_2\text{O}_5\text{-P}_2\text{O}_5$	121 mAh g ⁻¹ at 5 mA g ⁻¹	~47% after 5 cycles at 5 mA g ⁻¹	-	27
S- $\text{MnO}_2\text{-V}_2\text{O}_5$	~420 mAh g ⁻¹ at 60 mA g ⁻¹	-	-	28
FePO_4	12 mAh g ⁻¹ at 20 $\mu\text{A cm}^{-2}$	~50% after 20 cycles at 20 $\mu\text{A cm}^{-2}$	-	29
MoO_3	210 mAh g ⁻¹ at 0.02 mV s ⁻¹	~76% after 15 cycles at 0.02 mV s ⁻¹	-	30
MoO_3	220 mAh g ⁻¹ at 0.3 mA cm ⁻²	~95% after 10 cycles at 0.3 $\mu\text{A cm}^{-2}$	-	19
Co_3O_4	74 mAh g ⁻¹ at 0.1 mA	~60% after 30 cycles at 0.02 mA	-	31
RuO_2	101 mAh g ⁻¹ at 0.6 mA	~80% after 25 cycles at 0.6 mA	-	32
Ternary oxides				
$\text{Mo}_{2.48}\text{VO}_{9.93}$	397 mAh g ⁻¹ at 2 mA g ⁻¹	100% after 25 cycles at 4 mA g ⁻¹	114 mAh g ⁻¹ at 10 mA g ⁻¹	33
$\text{Ag}_x\text{Mn}_8\text{O}_{16}$	178 mAh g ⁻¹ at 50 mA g ⁻¹	47% after 20 cycles at 50 mA g ⁻¹	~15 mAh g ⁻¹ at 200 mA g ⁻¹	34
$\text{K}_x\text{Mn}_8\text{O}_{16}$	251 mAh g ⁻¹ at 50 mA g ⁻¹	75% after 20 cycles at 50 mA g ⁻¹	~50 mAh g ⁻¹ at 200 mA g ⁻¹	34
$\text{Mn}_{2.15}\text{Co}_{0.37}\text{O}_4$	~60 mAh g ⁻¹ at 0.1 mA cm ⁻²	~50% after 30 cycles at 0.1 mA cm ⁻²	-	35
$\text{Mg}_{0.1}\text{V}_2\text{O}_5$	^d ~300 mAh g ⁻¹	^d ~83% after 7 cycles	-	36
$\text{Mg}_{1.5}\text{MnO}_3$	~13 mAh g ⁻¹ at 7 mA g ⁻¹	~100% after 19 cycles at 7 mA g ⁻¹	-	37
MgMn_2O_4	220 mAh g ⁻¹ at 27 mA g ⁻¹	28% after 40 cycles at 27 mA g ⁻¹	110 mAh g ⁻¹ at 540 mA g ⁻¹	38

$\text{Mg}_x\text{MnO}_2 \cdot y\text{H}_2\text{O}$	$\sim 220 \text{ mAh g}^{-1}$ at 0.1 mA cm^{-2}	$\sim 45\%$ after 20 cycles at 0.1 mA cm^{-2}	-	39
$\text{Mg}_{1.1}\text{Mn}_6\text{O}_{12} \cdot 4.5\text{H}_2\text{O}$	$\sim 250 \text{ mAh g}^{-1}$ at 10 mA g^{-1}	$\sim 90\%$ after 200 cycles at 100 mA g^{-1}	$\sim 20 \text{ mAh g}^{-1}$ at 1 A g^{-1}	40
$\text{Mg}_{1.6}\text{Mn}_6\text{O}_{12} \cdot 5.7\text{H}_2\text{O}$	$\sim 300 \text{ mAh g}^{-1}$ at 10 mA g^{-1}	$\sim 84\%$ after 300 cycles at 100 mA g^{-1}	$\sim 25 \text{ mAh g}^{-1}$ at 1 A g^{-1}	41
$\text{Mg}_x\text{Mo}_{2.5+y}\text{VO}_{9+z}$	176 mAh g^{-1} at 2 mA g^{-1}	$\sim 57\%$ after 30 cycles at 10 mA g^{-1}	$\sim 100 \text{ mAh g}^{-1}$ at 20 mA g^{-1}	42
Mg silicates				
$\text{Mg}_{1.03}\text{Mn}_{0.97}\text{SiO}_4$	$\sim 115 \text{ mAh g}^{-1}$ at 62.9 mA g^{-1}	$\sim 104\%$ after 80 cycles at 62.9 mA g^{-1}	-	43
MgFeSiO_4	330 mAh g^{-1} at 6.62 mA g^{-1}	$\sim 100\%$ after 5 cycles at 6.62 mA g^{-1}	-	44
MgCoSiO_4	$\sim 170 \text{ mAh g}^{-1}$ at 30.57 mA g^{-1}	$\sim 128\%$ after 15 cycles at 61.14 mA g^{-1}	$\sim 40 \text{ mAh g}^{-1}$ at 183.42 mA g^{-1}	45
$\text{Mg}_{1.03}\text{Mn}_{0.97}\text{SiO}_4$	$\sim 210 \text{ mAh g}^{-1}$ at 62.8 mA g^{-1}	$\sim 96\%$ after 20 cycles at 62.8 mA g^{-1}	-	46
^c MWNT/C/ $\text{Mg}_{1.03}\text{Mn}_{0.97}\text{SiO}_4$	$\sim 300 \text{ mAh g}^{-1}$ at 62.9 mA g^{-1}	$\sim 100\%$ after 23 cycles at 157.3 mA g^{-1}	$\sim 120 \text{ mAh g}^{-1}$ at 157.3 mA g^{-1}	47
Sulfides				
CoS	$\sim 125 \text{ mAh g}^{-1}$ at 50 mA g^{-1}	$\sim 85\%$ after 60 cycles at 50 mA g^{-1}	$\sim 90 \text{ mAh g}^{-1}$ at 150 mA g^{-1}	48
TiS_2	236 mAh g^{-1} at 10 mA g^{-1}	$\sim 78\%$ after 80 cycles at 10 mA g^{-1}	140 mAh g^{-1} at 40 mA g^{-1}	49
Ti_2S_4	200 mAh g^{-1} at $\sim 12 \text{ mA g}^{-1}$	-	190 mAh g^{-1} at $\sim 47 \text{ mA g}^{-1}$	50
MoS_2	170 mAh g^{-1} at 20 mA g^{-1}	95% after 50 cycles at 20 mA g^{-1}	-	51
MoS_2/C	213 mAh g^{-1} at 50 mA g^{-1}	$\sim 39\%$ after 50 cycles at 50 mA g^{-1}	-	52
$\text{MoS}_2/\text{RGO}^f$	$\sim 105 \text{ mAh g}^{-1}$ at 20 mA g^{-1}	$\sim 87\%$ after 50 cycles at 20 mA g^{-1}	76 mAh g^{-1} at 50 mA g^{-1}	53
$\text{MoS}_2/\text{graphene}$	$\sim 116 \text{ mAh g}^{-1}$ at 20 mA g^{-1}	$\sim 70\%$ after 50 cycles at 20 mA g^{-1}	-	54
Mo_6S_8	$\sim 105 \text{ mAh g}^{-1}$ at 15.25 mA g^{-1}	$\sim 90\%$ after 100 cycles at 15.25 mA g^{-1}	-	55
Mo_6S_8	110 mAh g^{-1} at 15.25 mA g^{-1}	$\sim 95\%$ after 250 cycles at 128 mA g^{-1}	80 mAh g^{-1} at 128 mA g^{-1}	56
$\text{Cu}_x\text{Mo}_6\text{S}_8$	$\sim 125 \text{ mAh g}^{-1}$	$\sim 98\%$ after 30 cycles	$\sim 90 \text{ mAh g}^{-1}$	57

	at 6 mA g ⁻¹	at 12 mA g ⁻¹	at 1.2 A g ⁻¹	
Mg _x Mo ₃ S ₄	~122 mAh g ⁻¹ at 0.3 mA cm ⁻²	~100% after 600 cycles at 0.3 mA cm ⁻²	-	58
Mg _x Mo ₆ S ₆ Se ₂	~110 mAh g ⁻¹ at 15.25 mA g ⁻¹	~91% after 100 cycles at 15.25 mA g ⁻¹	~80 mAh g ⁻¹ at 122 mA g ⁻¹	59
Selenides				
WSe ₂	~220 mAh g ⁻¹ at 50 mA g ⁻¹	~92% after 160 cycles at 50 mA g ⁻¹	103 mAh g ⁻¹ at 3 A g ⁻¹	60
TiSe ₂	~130 mAh g ⁻¹ at 5 mA g ⁻¹	~69% after 50 cycles at 5 mA g ⁻¹	103 mAh g ⁻¹ at 3 A g ⁻¹	61
Cu ₂ Se	~260 mAh g ⁻¹ at 5 mA g ⁻¹	~85% after 4 cycles at 5 mA g ⁻¹	-	62
Carbon allotropes				
Fullerenes	50 mAh g ⁻¹ at 19 μA cm ⁻²	8% after 10 cycles at 75 μA cm ⁻²	22 mAh g ⁻¹ at 1.5 mA cm ⁻²	63
Fluorinated graphene	110 mAh g ⁻¹ at 10 mA g ⁻¹	80% after 30 cycles at 100 mA g ⁻¹	50 mAh g ⁻¹ at 100 mA g ⁻¹	64
Graphite fluorides	813 mAh g ⁻¹ at 20 mA g ⁻¹	-	430 mAh g ⁻¹ at 400 mA g ⁻¹	65
Graphite fluorides	572 mAh g ⁻¹ at 10 mA g ⁻¹	-	-	66
Organic-based cathodes				
1,4-polyanthraquinone	~130 mAh g ⁻¹ at 130 mA g ⁻¹	~80% after 100 cycles at 130 mA g ⁻¹	~50 mAh g ⁻¹ at 1.3 A g ⁻¹	67
Poly(hydroquinoyl-benzoquinonyl sulfide)	~70 mAh g ⁻¹ at 50 mA g ⁻¹	158 mAh g ⁻¹ after 20 cycles at 50 mA g ⁻¹	-	68
2,5-Dimethoxy-1,4-Benzoquinone	226 mAh g ⁻¹ at 63.8 mA g ⁻¹	~33 after 30 cycles at 63.8 mA g ⁻¹	-	69
poly(antraquinoyl) sulfide	225 mAh g ⁻¹ at 50 mA g ⁻¹	~22% after 100 cycles at 50 mA g ⁻¹	~100 mAh g ⁻¹ at 500 mA g ⁻¹	70
Others				
VOCI	170 mAh g ⁻¹ at 5 mA g ⁻¹	~76% after 70 cycles at 5 mA g ⁻¹	-	71
AgCl	178 mAh g ⁻¹ at 23 mA g ⁻¹	~45% after 100 cycles at 930 mA g ⁻¹	104 mAh g ⁻¹ at 1.86 A g ⁻¹	72

^a the value of the capacities were obtained at room temperature

^b GO: graphite oxide. ^c CNF: carbon nanofoam. ^d current density not provided.

^e MWNT: multiwalled carbon nanotubes. ^f RGO: reduced graphene oxide

Table S2 A survey of electrochemical performance of anodes in Mg battery

Anode materials	^a Initial discharge capacity	Cycling stability	Rate capability	Ref (year)
Mn ₃ O ₄	~2500 mAh g ⁻¹ at 15.4 mA g ⁻¹	~86% after initial 200 cycles at 770 mA g ⁻¹	~250 mAh g ⁻¹ at 770 mA g ⁻¹	This work
MnO ₂ /AB ^b	310 mAh g ⁻¹ at 100 mA g ⁻¹	~0% after 20 cycles at 100 mA g ⁻¹	-	73
MgMn ₂ O ₄	150 mAh g ⁻¹ at 60 μA	~60% after 20 cycles at 60 μA	-	74
Sn	~450 mAh g ⁻¹ at 4.5 mA g ⁻¹	~51% after 10 cycles at 9 mA g ⁻¹	~180 mAh g ⁻¹ at 45 mA g ⁻¹	75
Sn	346 mAh g ⁻¹ at ~54 mA g ⁻¹	90% after 30 cycles at ~135 mA g ⁻¹	~290 mAh g ⁻¹ at ~135 mA g ⁻¹	76
SnSb/graphene	~420 mAh g ⁻¹ at 50 mA g ⁻¹	~80% after 200 cycles at 50 mA g ⁻¹	-	77
Bi	350 mAh g ⁻¹ at 19.25 mA g ⁻¹	~92% after 200 cycles at 19.25 mA g ⁻¹	216 mAh g ⁻¹ at 1.9 A g ⁻¹	78
Bi	~400 mAh g ⁻¹ at 192.5 mA g ⁻¹	~50% after 100 cycles at 192.5 mA g ⁻¹	-	79
TiS ₂	270 mAh g ⁻¹ at ~12 mA g ⁻¹	-	140 mAh g ⁻¹ at ~47 mA g ⁻¹	80
Li ₄ Ti ₅ O ₁₂	175 mAh g ⁻¹ at 15 mA g ⁻¹	100% after 500 cycles at 300 mA g ⁻¹	300 mAh g ⁻¹ at 50 mA g ⁻¹	81
Na ₂ Ti ₃ O ₇	~135 mAh g ⁻¹ at 20 mA g ⁻¹	96% after 500 cycles at 200 mA g ⁻¹	40 mAh g ⁻¹ at 1 A g ⁻¹	82
Natural graphite	35 mAh g ⁻¹ at 37.2 mA g ⁻¹	63% after 100 cycles at 37.2 mA g ⁻¹	-	83

^a the value of the capacities were obtained at room temperature.

^b AB: acetylene black.

SUPPLEMENTARY REFERENCE

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