Supplementary data

Simply Prepared Magnesium Vanadium Oxides as Cathode Materials for Rechargeable Aqueous Magnesium Ion Batteries

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Table S1. Assignation of the FTIR and Raman spectral bands of the MgVO precursor material.

Band position	Assignation	reference
FTIR spectra		
1417cm^{-1}	NH_4VO_3- stretching $\nu(NH_4^+)$	[62]
930 cm^{-1}	NH_4VO_3- stretching symmetric $\nu_s(VO_2)$	[62]
896 cm^{-1}	NH_4VO_3- stretching asymmetric $\nu_{as}(VO_2)$	[62]
850 cm^{-1}	NH_4VO_3	[62]
685 cm^{-1}	NH_4VO_3- stretching asymmetric ν_{as}(VOV)	[62]
500 cm^{-1}	NH_4VO_3- stretching symmetric ν_s(VOV)	[62]
Raman spectra		
928cm^{-1}	NH_4VO_3- stretching symmetric $\nu_s(VO_2)$	[62]
897cm^{-1}	NH_4VO_3- stretching asymmetric $\nu_{as}(VO_2)$	[62]
646 cm^{-1}	NH_4VO_3- stretching asymmetric ν_{as}(VOV)	[62]
496 cm^{-1}	NH_4VO_3- stretching symmetric ν_s(VOV)	[62]
383 cm^{-1}; 350cm^{-1}	NH_4VO_3	[62]
322 cm^{-1}	NH_4VO_3- bending $\delta(VO_2)$	[62]
259 cm^{-1}; 213 cm^{-1}	NH_4VO_3	[62]

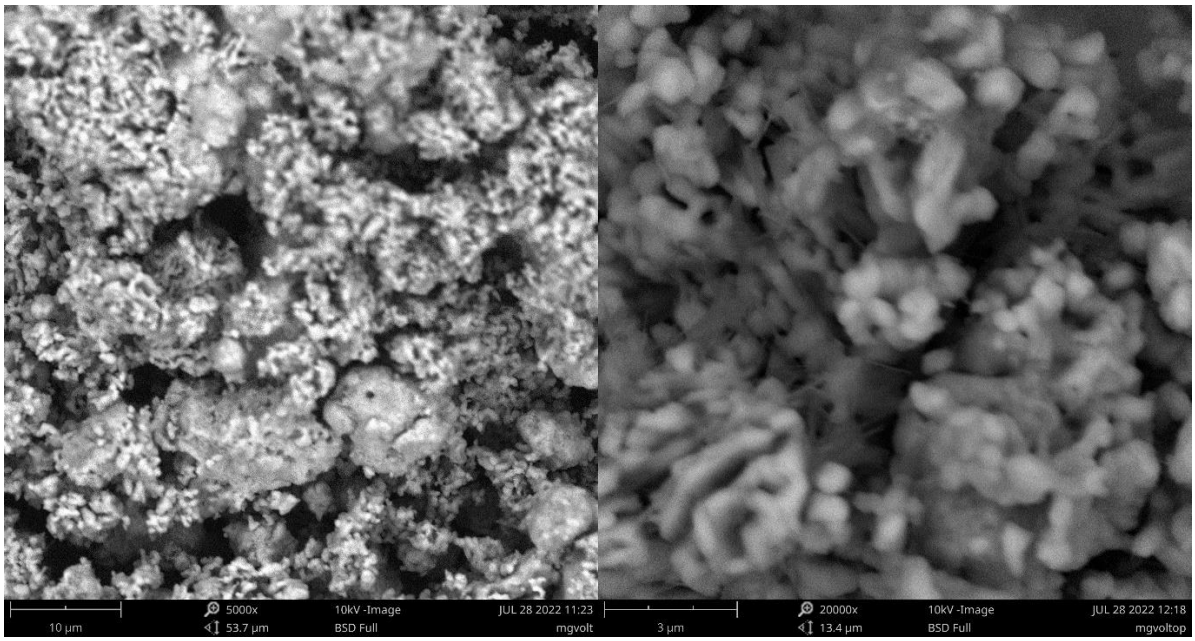

Figure S1. SEM micrographs of MgVO-LT at different positions and magnifications.

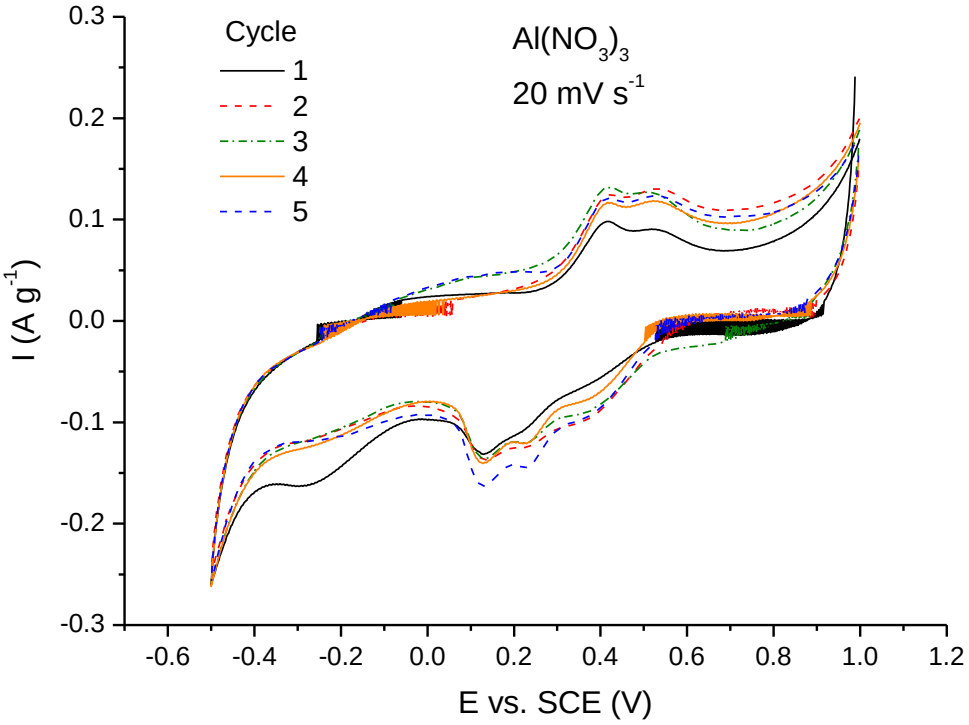

Figure S2. Cyclic voltammograms of MgVO-HT in 1M $Al(NO_3)_3$, at 20 mV s^{-1}.

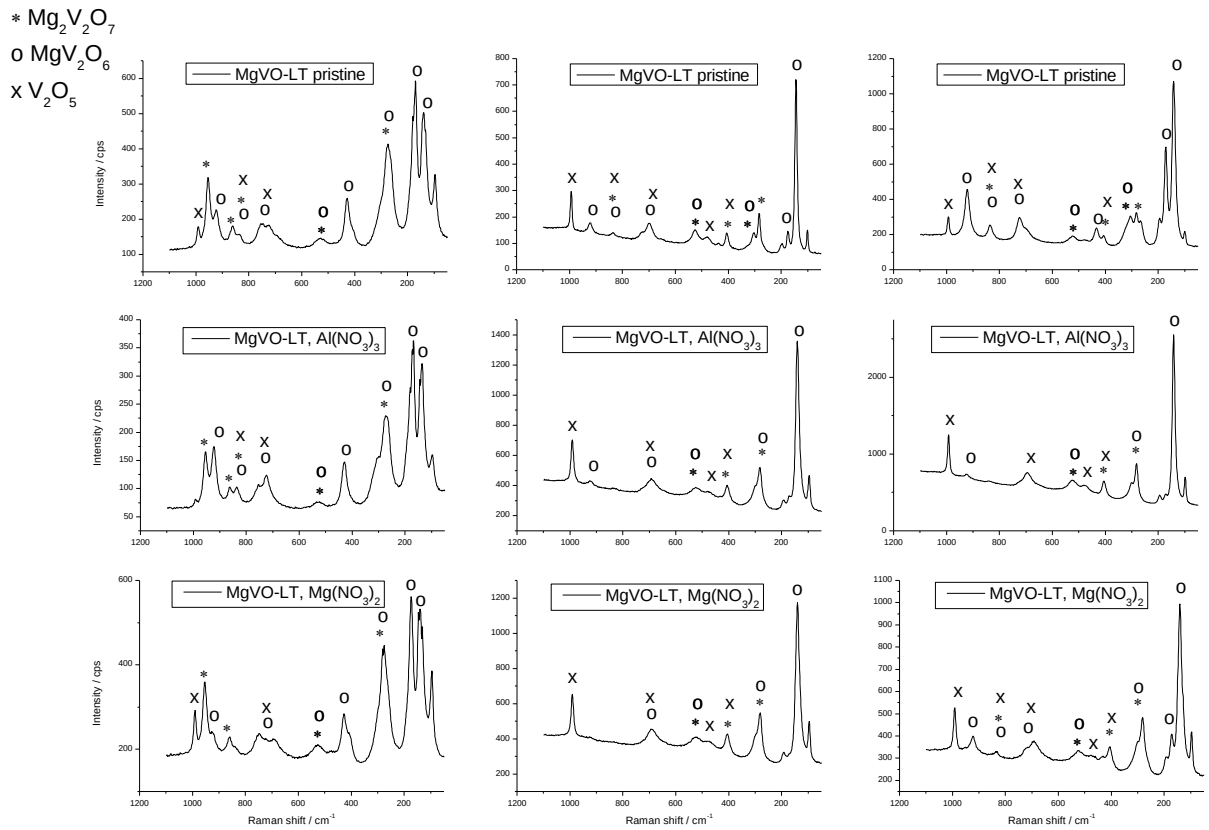

Figure S3. Raman spectra of the MgVO-LT electrode material acquired at different spots, before and after electrochemical treatments in $Mg(NO_3)_2$ and $Al(NO_3)_3$.

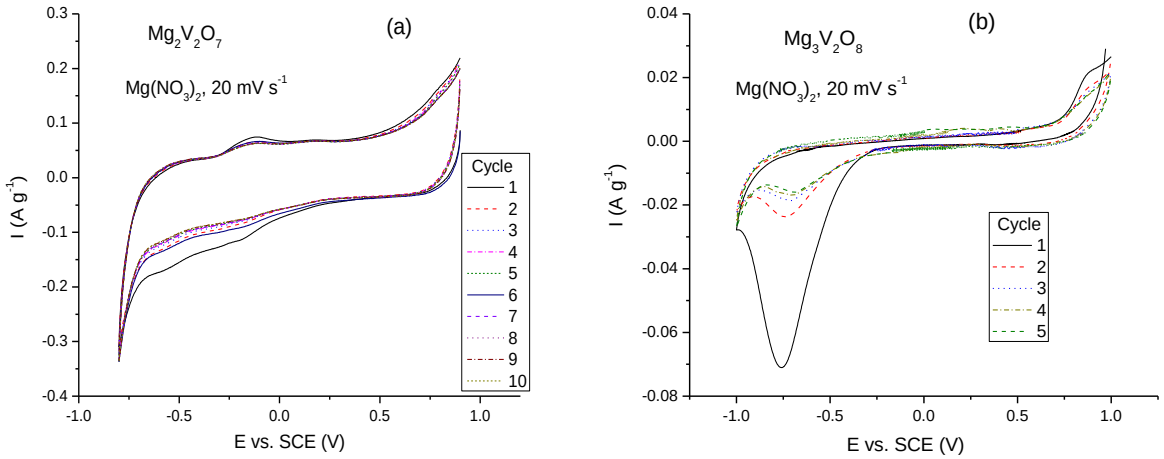

Figure S4. Cyclic voltammograms of $Mg_2V_2O_7$ (a) and $Mg_3V_2O_8$ (b) materials in 3 M $Mg(NO_3)_2$, at 20 mV s^{-1}.

Table S2. Comparative electrochemical properties of VO-based oxides in Mg-containing aqueous solutions.

Material	Electrolyte	Capacity / mAh g^{-1}	Current / A g^{-1}	Ref.
MgV_3O_8,/$Mg_3V_2O_8$/MgV2O4 cathode (MgVO/C)	3 M $Mg(NO_3)_2$	65 48 30	0.2 0.9 4.6	This work
V_2O_5/MgV_2O_6/$Mg_2V_2O_7$ cathode (MgVO-LT)	3 M $Mg(NO_3)_2$	35 20 14	0.1 0.5 5	This work
V_2O_5 cathode AACVD* synt. at 500°C	0.075 M $MgCl_2$	427 225 170	5.9 3.9 2.4	[77]
V_2O_5, AACVD* synt. at 600°C (cathode)	0.075 M $MgCl_2$	300 270 230	15 4.9 3.9	[78]
V_2O_5 xerogel/graphite cathode	3 M $Mg(NO_3)_2$	100 53 44	1 3 5	[40]
NaV_6O_{15}/NaV_6O_{16}	3 M $Mg(NO_3)_2$	109	20 mVs^{-1}	[41]
$FeVO_4$ anode	1 M $MgSO_4$	140 100 51	0.05 0.1 0.5	[79]
$FeVO_4$/C anode	1 M $MgSO_4$	184 135 88 mAh g^{-1}	0.05 0.1 0.5	[79]

*AACVD – aerosol assisted chemical vapor deposition