Electronic Supplementary Material (ESI) for Nanoscale.

Control of crystal size determines the electrochemical performance of α-V_2O_5 as an Mg^{2+} intercalation host

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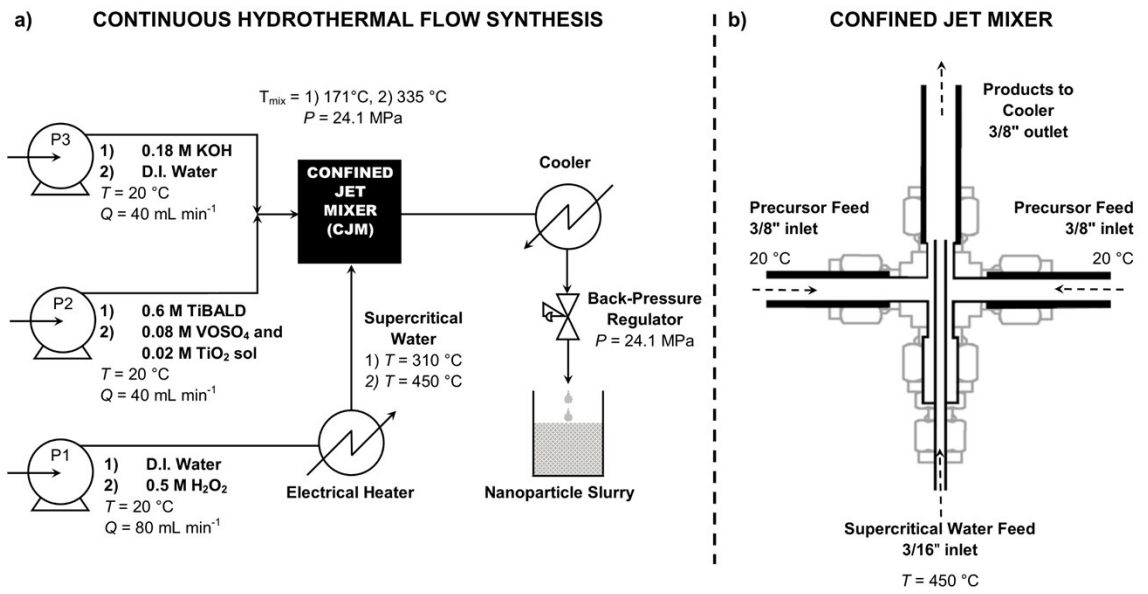

Figure S1. a) A schematic of the Continuous Hydrothermal Flow Synthesis (CHFS) apparatus with the precursors, concentrations, and temperatures listed for reactions 1) and 2) as described in the text; b) a schematic of the Confined Jet Mixer (CJM).

Table S1. Lattice parameters and crystallite sizes of the V_2O_5 and V_2O_5-TiO_2 materials calculated from Rietveld refinement, with the figures-of-merit of the fits included. Lattice parameters of the V_2O_5 reference are included for comparison.

Material	a / Å	b / Å	c / Å	V / Å^3	d / nm	R_{wp}	χ^2
PDF 01-072-0433	11.510(8)	4.369(5)	3.563(3)	179.2(5)	-	4.4	-
V_2O_5 sample	11.5119(5)	4.37061(19)	3.56349(15)	179.29(2)	140	13.7	3.5
V_2O_5-TiO_2 composite	11.553(3)	4.3716(14)	3.5703(8)	180.32(15)	25	7.1	1.4

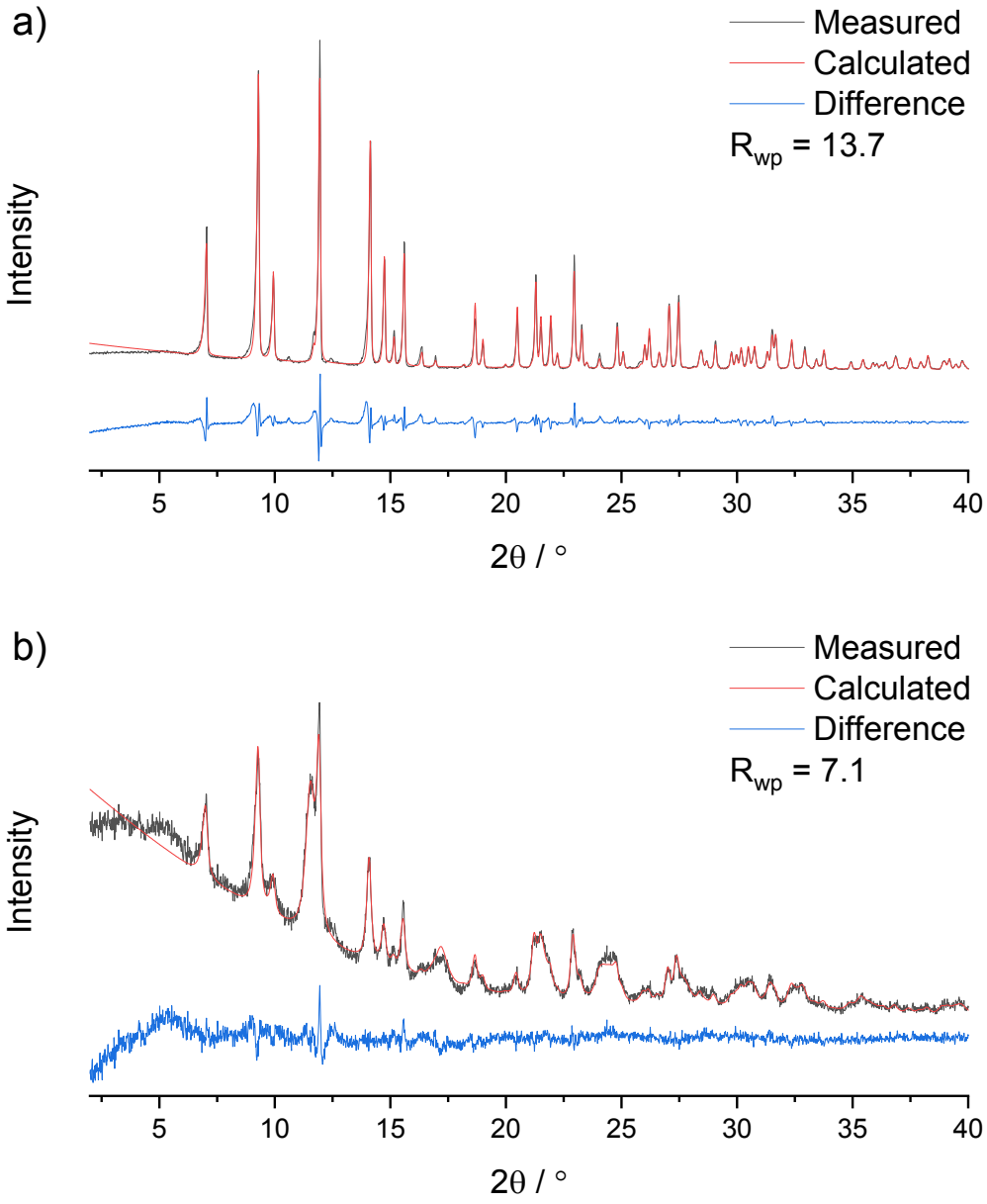

Figure S2. Rietveld refinement plots of a) the V_2O_5 sample and b) the V_2O_5-TiO_2 composite, λ = 0.709 Å.

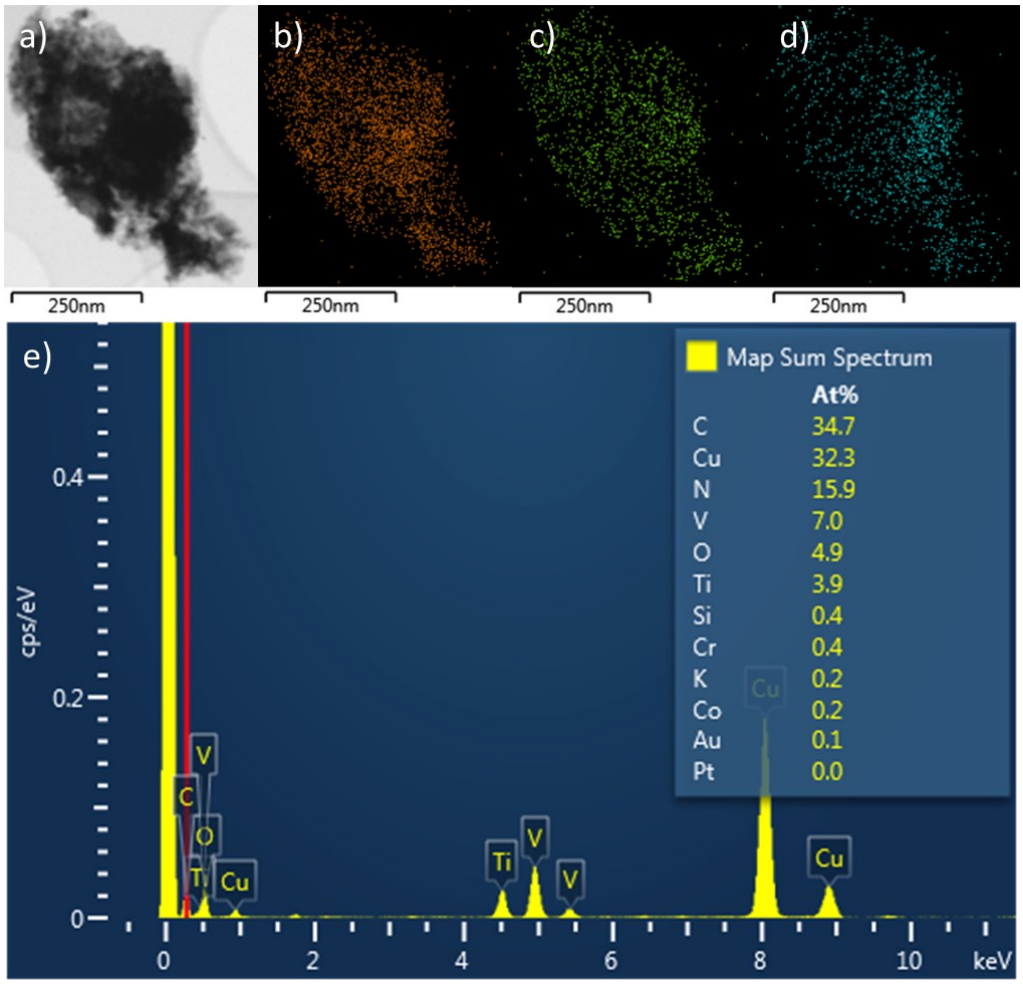

Figure S3. EDS mapping of the pristine V_2O_5-TiO_2 composite, displaying a) the electron image, b) the V K-α signals, c) the Ti K-α signals, d) the O K-α signals, and e) the EDS spectrum.

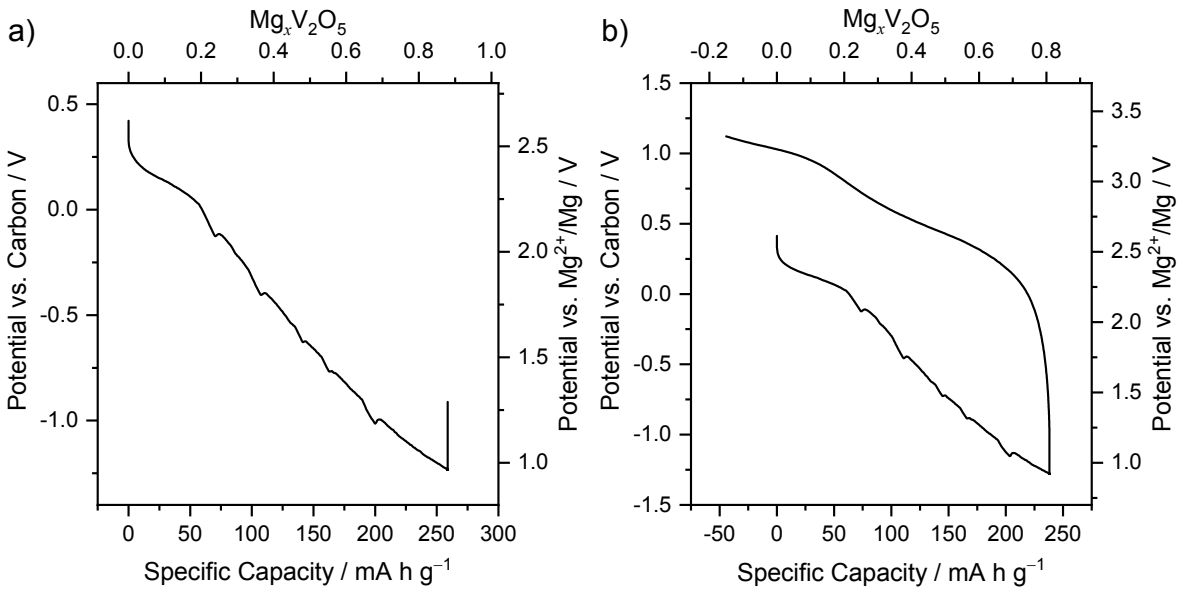

Figure S4. Voltage profiles of the a) discharged and b) charged electrodes used in ex-situ elemental, redox, and structural analysis.

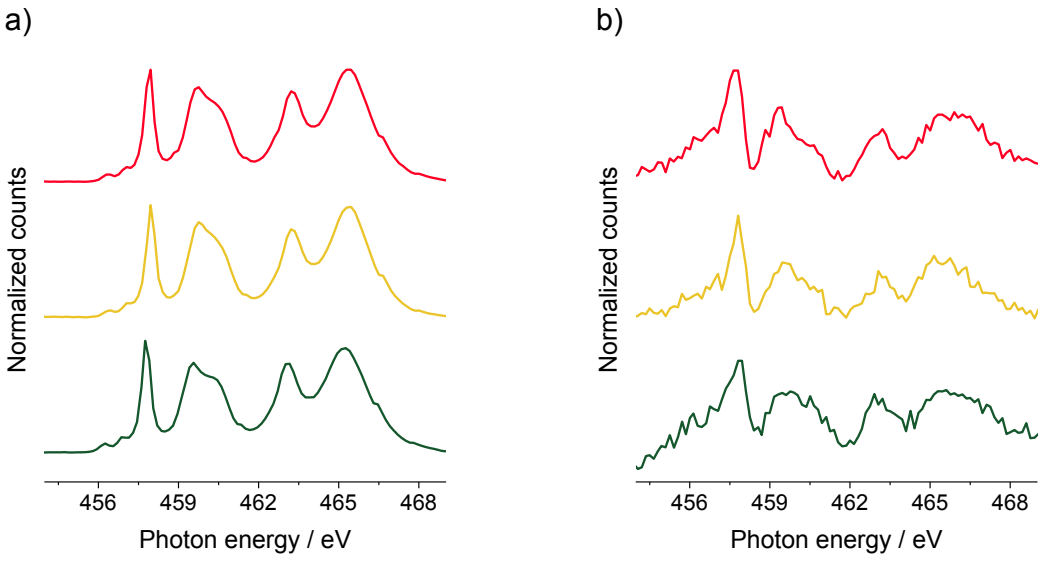

Figure S5. a) TEY XAS for the pristine (green line), discharged (yellow line) and charged (red line) electrodes, corresponding to surface states for the Ti $L_{2,3}$ edges of V_2O_5-TiO_2 samples. b) TFY XAS for the pristine (green line), discharged (yellow line) and charged (red line) electrodes, corresponding to bulk states for the Ti $L_{2,3}$ edges of V_2O_5-TiO_2 samples.

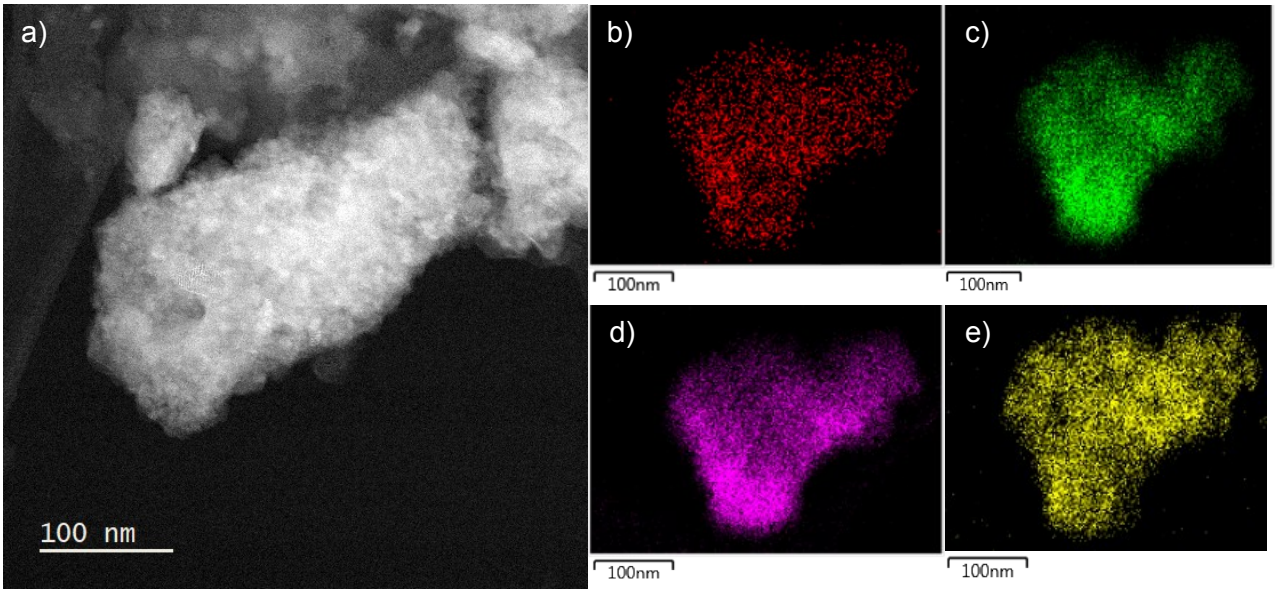

Figure S6. EDS mapping of the discharged V_2O_5-TiO_2 composite, displaying a) an electron image of a discharged particle, b) the Mg-Kα signals, c) the V-Kα signals, d) the Ti-Kα signals, e) the O-Kα signals.

Table S2. Elemental ratios of Mg:V within different particles of the discharged V_2O_5-TiO_2 composite found by EDS analysis, normalized to V content.

Particle No.	Mg content	V content
1	0.62	2
2	0.29	2
3	0.32	2
4	0.31	2
5	0.33	2
6	0.11	2
7	0.15	2
8	0.12	2

Table S3. Elemental ratios of Mg:V within different particles of the charged V_2O_5-TiO_2 composite found by EDS analysis, normalized to V content.

Particle No.	Mg content	V content
1	0.057	2
2	0.084	2
3	0.075	2
4	0.083	2