

Supporting Information

Electrochemical Performance of Large Grained NaCrO₂ Cathode Materials for Na-ion Batteries Synthesized by Decomposition of Na₂Cr₂O₇•2H₂O

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Synthesis of s-NCO: First, a stoichiometric amount of Na_2CO_3 (5% excess) and Cr_2O_3 were thoroughly mixed by ball-milling with ethanol as dispersing agent. Then, the mixture was calcined in an alumina crucible at 900 °C in Ar atmosphere for 10 h hours to obtain s-NCO.

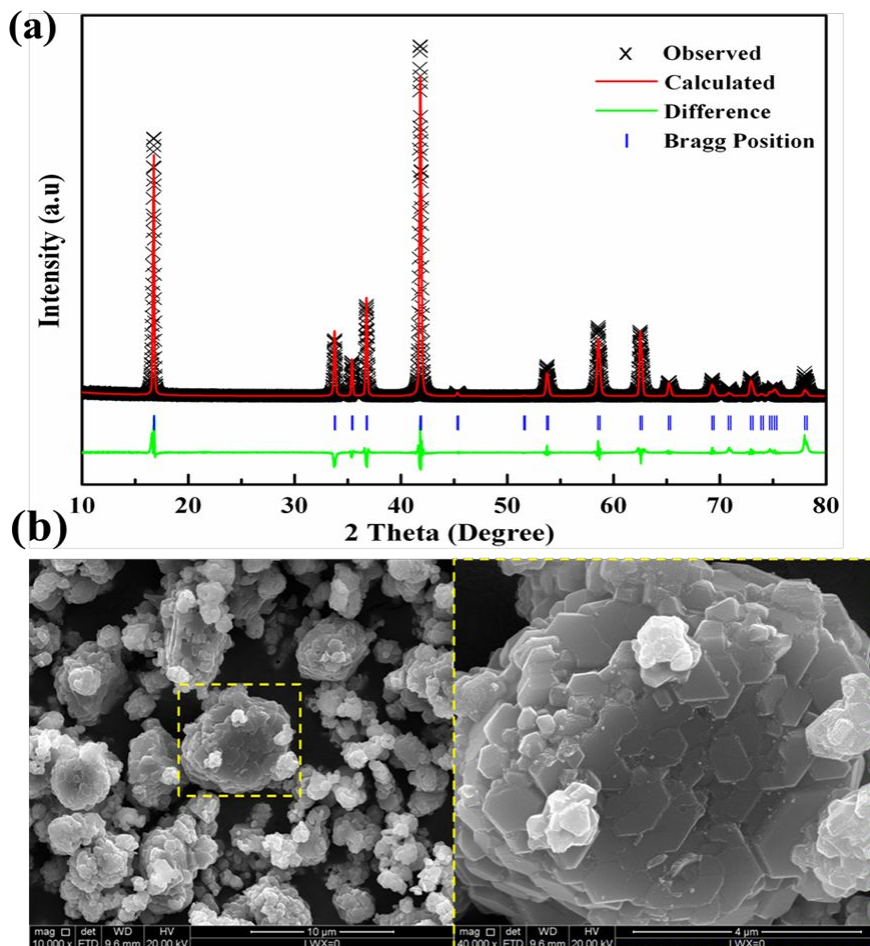


Figure S1. (a) Results of the Rietveld refinement on a powder X-ray diffraction pattern of NaCrO_2 synthesized by traditional solid-state reaction (s-NCO). (b) SEM images of s-NCO particles at different resolutions.

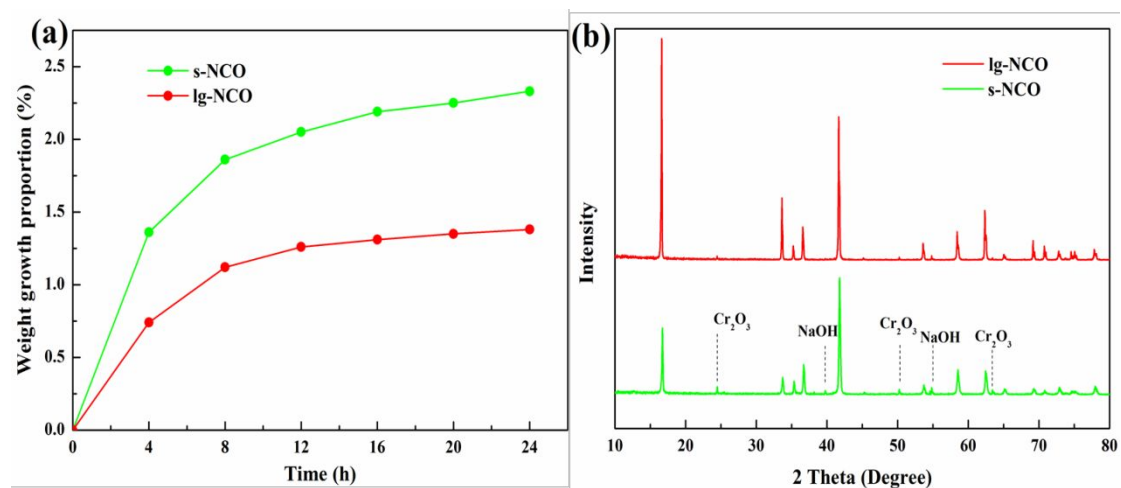


Figure S2. (a) Mass change rate of s-NCO and lg-NCO obtained in ambient air over 24 h. (b) XRD patterns of s-NCO and lg-NCO after exposure to ambient air for 24h.

Table S1. Parameters obtained by the Rietveld refinement of lg-NCO and s-NCO.

Sample	a(Å)	c(Å)	V (Å ³)	Rwp
lg-NCO	2.97334	15.97563	122.35	0.0860
s-NCO	2.97429	15.97655	122.40	0.0964

Table S2. The particle size, specific area and tap density of lg-NCO and s-NCO powder.

	D50/μm	BET/m ² /g	TD/ g•cm ³
lg-NCO	22.10	1.65	2.55
s-NCO	2.157	13.69	1.57

Table S3. A comparison of some recently reported NaCrO₂ materials (1 C=100 mA g⁻¹).

Materials	Capacity retention	Capacity [mAh g ⁻¹]	Rate [mAh g ⁻¹]	Voltage range [V]
C-NaCrO ₂ ^[18]	93%/40 cycles	118/0.05C	0.25C(85)	2.6-3.4
C-NaCrO ₂ ^[19]	96%/50 cycles	121/0.2C	55C(106)	2.0-3.6
Bare NaCrO ₂ ^[19]	80%/50 cycles	112/0.2C	21C(15)	2.0-3.6
Bare NaCrO ₂ ^[15]	Not reported	110/0.25C	Not reported	2.0-3.6
Bare NaCrO ₂ ^[11]	77%/50 cycles	110/0.125C	Not reported	2.5-3.6
Bare NaCrO ₂ ^[21]	95%/45 cycles	99/0.3C	Not reported	2.0-3.6
Na _{0.95} Cr _{0.95} Ti _{0.05} O ₂ ^[16]	80%/800 cycles	104/0.1C	30C(67)	2.3-3.6
Bare NaCrO ₂ (this work)	94%/80 cycles	123/0.1C	25C(51)	2.3-3.6

Table S4. Comparison of Na ions diffusion coefficients of various cathode materials.

Materials	Na ions diffusion coefficients (cm ² s ⁻¹)
NaCrO ₂ (this work)	2.33×10 ⁻¹¹
Na _{0.95} Cr _{0.95} Ti _{0.05} O ₂ ^[16]	2.27×10 ⁻¹²
NaFe _{0.45} Co _{0.5} Mg _{0.05} O ₂ ^[28]	1.15×10 ⁻¹⁰
Na(NiCoFeTi) _{0.25} O ₂ ^[29]	1.64×10 ⁻¹¹
NaNi _{0.5} Mn _{0.5} O ₂ ^[30]	1.99×10 ⁻¹²
NaMn _{1/3} Fe _{1/3} Cu _{1/6} Mg _{1/6} O ₂ ^[31]	2.74×10 ⁻¹⁴
NaMn _{0.5} Ni _{0.2} Fe _{0.3} O ₂ ^[3]	1.63×10 ⁻¹²