Rapid Microwave-Assisted Synthesis and Electrode Optimization of Organic Anode Materials in Sodium-Ion Batteries

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Supporting Information

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**Figure S1.** Calculated PXRD pattern for Na$_2$NDC (Ref. S1) compared to as-synthesized phase of Na-NDC (MW).

**Figure S2.** SEM images for pristine phase of Na-NDC (MW).
**Figure S3.** TGA profile for Na-NDC (MW).

**Figure S4.** VT-PXRD patterns for Na-NDC (MW) recorded in air for stepwise heating from 25 °C (pink) to 500 °C (dark blue), and a measurement after cooling back to 25 °C (purple).
Figure S5. Comparison of PXRD profiles for products at different ratios of the precursors.

Figure S6. Comparison of PXRD profiles for products from different sodium salts.
**Figure S7.** PXRD patterns for Na-BDC (MW) and Na-BPDC (MW) compared with calculated patterns calculated from crystal structures of Na$_2$BDC (Refcode: QQQDHD01, Ref. S2) and NaHBDC (Refcode: BEBFIY, Ref. S3) or Na$_2$BPDC (Refcode: MOFTUY, Ref. S4) and NaHBPDC (Refcode: MOFVAG, Ref. S4).

**Figure S8.** PXRD pattern for air-dried phase of Na-NDC (MW) electrode prepared using PVDF binder (red) and the phase after heating under vacuum at 80 °C overnight, compared to that of pristine phase of Na$_2$NDC (MW).
**Figure S9.** Charge/discharge curves for Na-NDC (MW) cycled at 25 mA g$^{-1}$ from 0.05-2.5 V in an electrode (60% Active, 30% Super C65, 10% PVDF) prepared by using PVDF as the binder.

**Figure S10.** SEM images for the recrystallized phase of Na-NDC (MW).
Figure S11. PXRD pattern for recrystallized phase of Na-NDC (MW) from water (red) and after heating the recrystallized phase under vacuum at 110 °C overnight (blue), compared to the pristine phase (gray).

Figure S12. TGA profile for recrystallized phase of Na-NDC (MW).
Figure S13. SEM images for air-dried electrode with composition – 60% active, 30% Super C65, 10% CMC binder.

Figure S14. PXRD pattern for air-dried phase of Na-NDC (MW) electrode prepared using CMC binder (red) and the phase after heating under vacuum at 110 °C overnight, compared to that of calculated phase of Na₂NDC (gray) (Ref. S1).
Figure S15. SEM images for air-dried electrode with 60% active material, 30% Super C65 and 10% sodium alginate as binder.

Figure S16. Discharge capacities for cells cycled from 0.05-2.5 V at 25 mA g\(^{-1}\) in electrodes prepared from CMC and sodium alginate with composition – 60% active, 30% Super C65, 10% binder.
Figure S17. Differential capacity plot for Na-NDC (MW) cycled at 25 mA g\(^{-1}\) from 0.05-2.5 V in an electrode prepared by using CMC as the binder (60% Active, 30% Super C65, 10% CMC).

Figure S18. a) Differential capacity for 3\(^{\text{rd}}\) cycle and b) discharge capacities for 50 cycles of electrode prepared using 90% conductive carbon (Super C65) and 10% CMC binder, cycled at 25 mA g\(^{-1}\) between 0.05-2.5 V. As the capacity stabilises at ~112 mAh g\(^{-1}\), an approximate maximum capacity contribution for electrodes prepared using 30% conductive carbon would be ~37.33 mAh g\(^{-1}\).
Figure S19. Discharge capacities for Na-NDC (MW) cycled at two different current rates – 200 mA g\(^{-1}\) and 500 mA g\(^{-1}\), for 75 cycles between 0.05-2.5 V.

Figure S20. SEM images for air-dried electrode with composition – 80% active, 10% Super C65 and 10% CMC binder.
Figure S21. Discharge capacity and Coulombic efficiency for cell cycled at 25 mA g$^{-1}$ between 0.05-2.5 V with electrode composition – 70% Active, 20% Super C65, 10% CMC.

Figure S22. Discharge capacity and Coulombic efficiency for cell cycled at 25 mA g$^{-1}$ between 0.05-2.5 V with electrode composition – 80% Active, 10% Super C65, 10% CMC.
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