

Electronic Supplementary Information (ESI)

Sodiation-driven amorphous Co-based species in slope-dominant hard carbon with ultralong cycling life for sodium-ion hybrid capacitors

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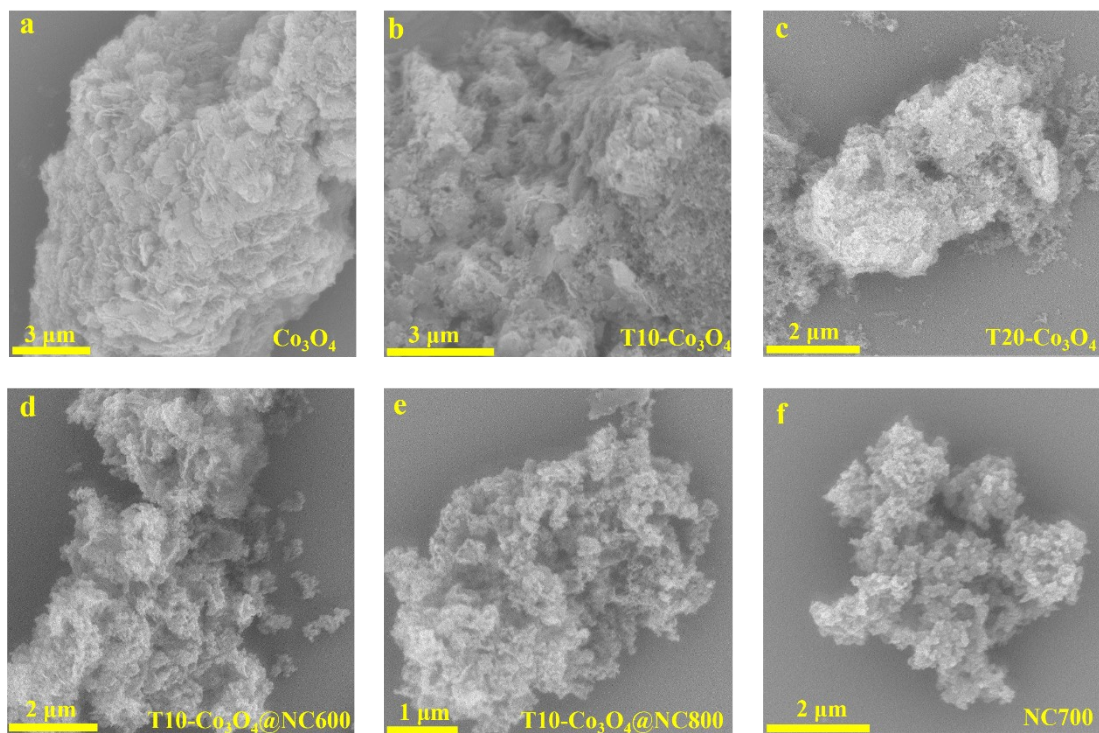


Fig. S1. The SEM for (a) Co_3O_4 , (b) $\text{T10-Co}_3\text{O}_4$, (c) $\text{T20-Co}_3\text{O}_4$, (d) $\text{T10-Co}_3\text{O}_4@\text{NC600}$, (e) $\text{T10-Co}_3\text{O}_4@\text{NC800}$, and (f) NC700 .

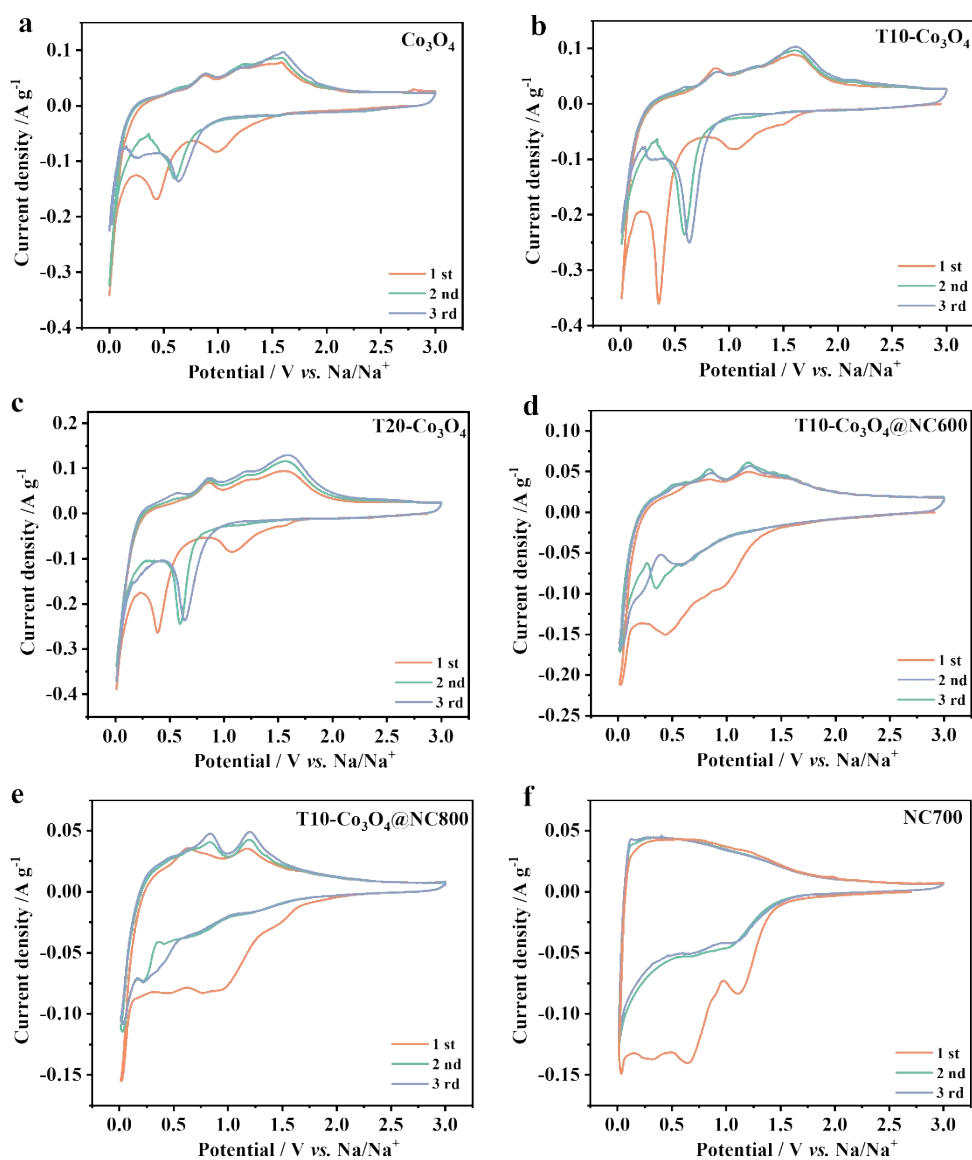


Fig. S2. The first three laps CV plots at 0.1 mV s^{-1} for (a) Co_3O_4 , (b) $\text{T10-Co}_3\text{O}_4$, (c) $\text{T20-Co}_3\text{O}_4$, (d) $\text{T10-Co}_3\text{O}_4@\text{NC600}$, (e) $\text{T10-Co}_3\text{O}_4@\text{NC800}$, and (f) NC700 .

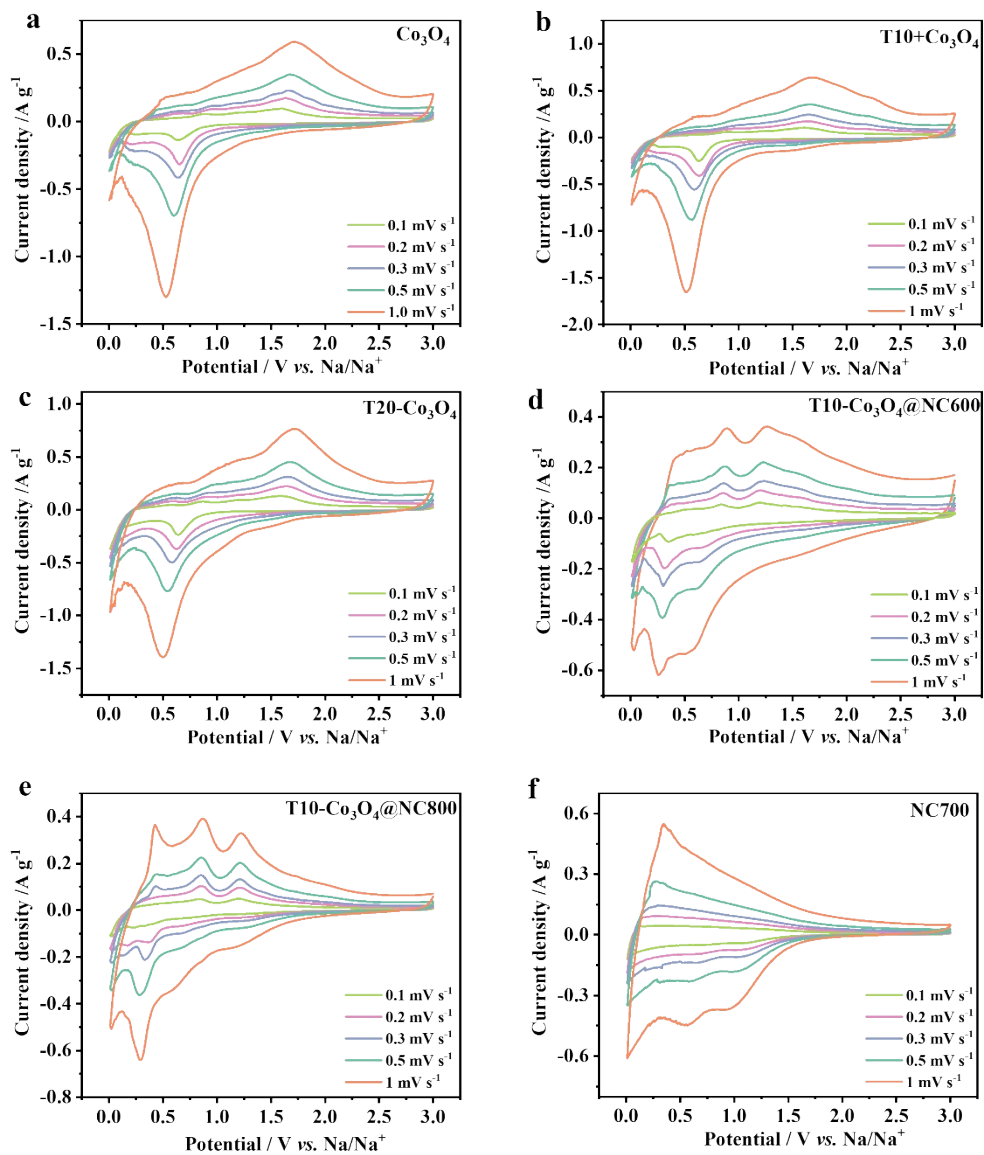


Fig. S3. The CV plots at 0.1-1 mV s^{-1} for (a) Co_3O_4 , (b) $\text{T10-Co}_3\text{O}_4$, (c) $\text{T20-Co}_3\text{O}_4$, (d) $\text{T10-Co}_3\text{O}_4@\text{NC600}$, (e) $\text{T10-Co}_3\text{O}_4@\text{NC800}$, and (f) NC700 .

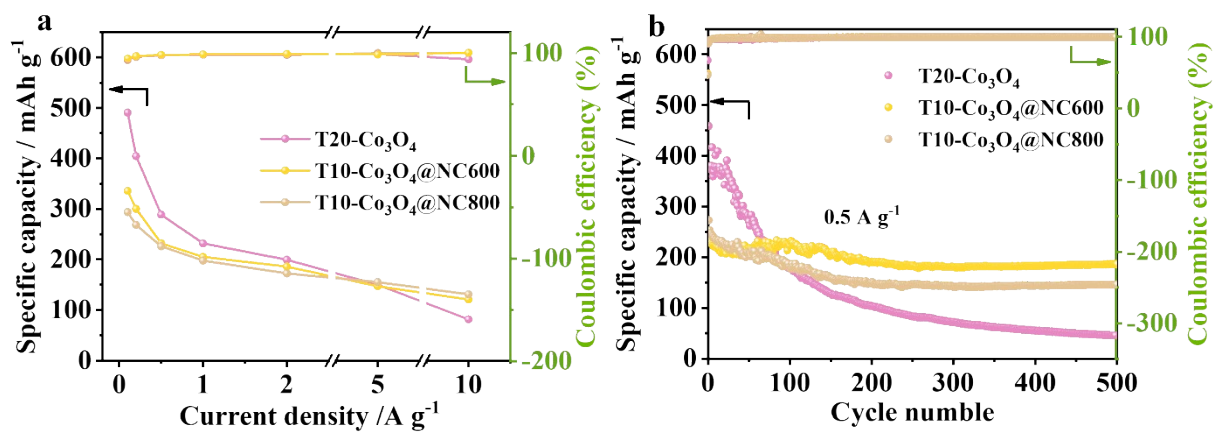


Fig. S4. The rate performance (a) and cycling performance (b) of the T20-Co₃O₄, T10-Co₃O₄@NC600, and T10-Co₃O₄@NC800 electrodes.

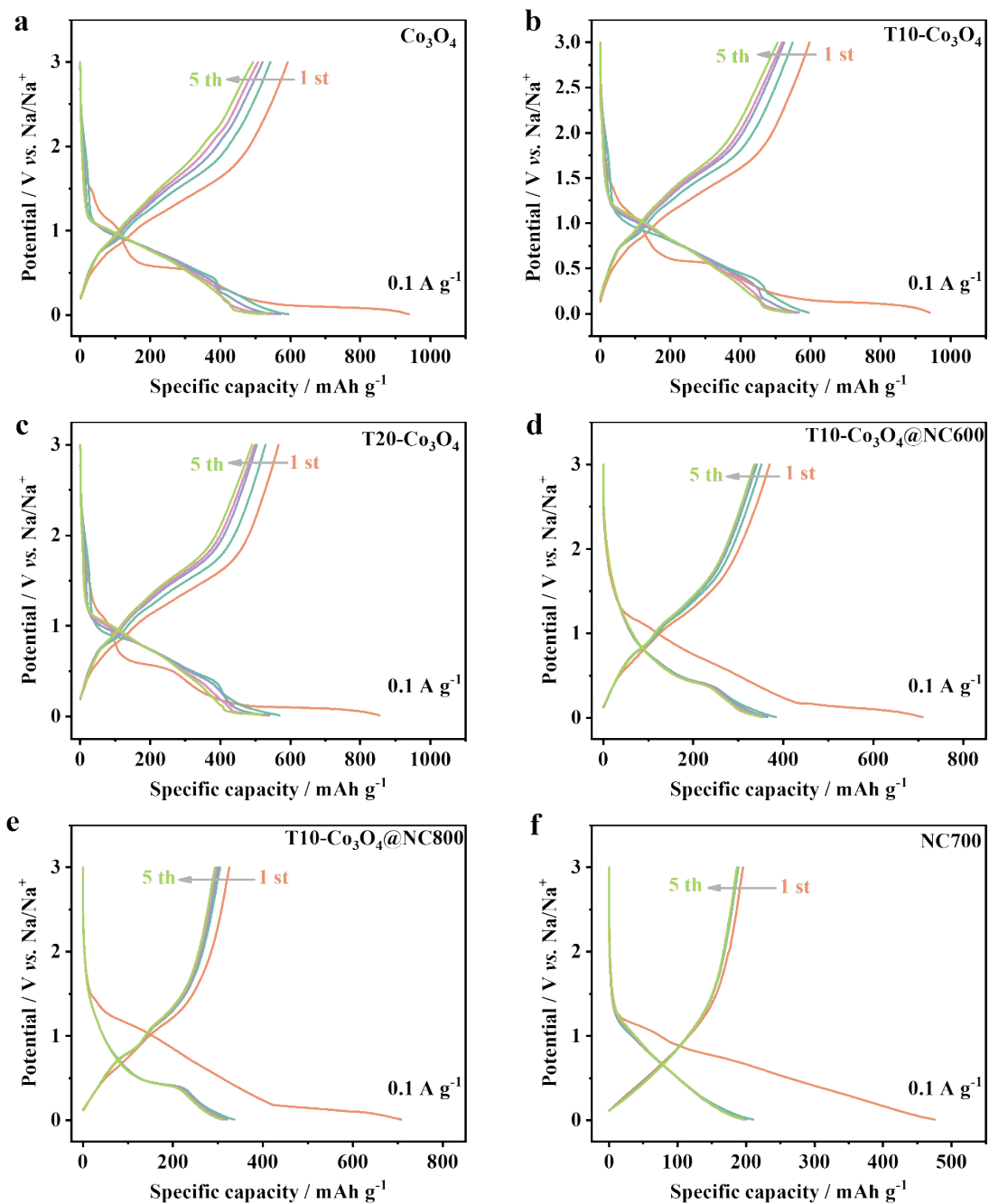


Fig. S5. GCD curves of (a) Co_3O_4 , (b) $\text{T10-Co}_3\text{O}_4$, (c) $\text{T20-Co}_3\text{O}_4$, (d) $\text{T10-Co}_3\text{O}_4@\text{NC600}$, (e) $\text{T10-Co}_3\text{O}_4@\text{NC800}$, and (f) NC700 .

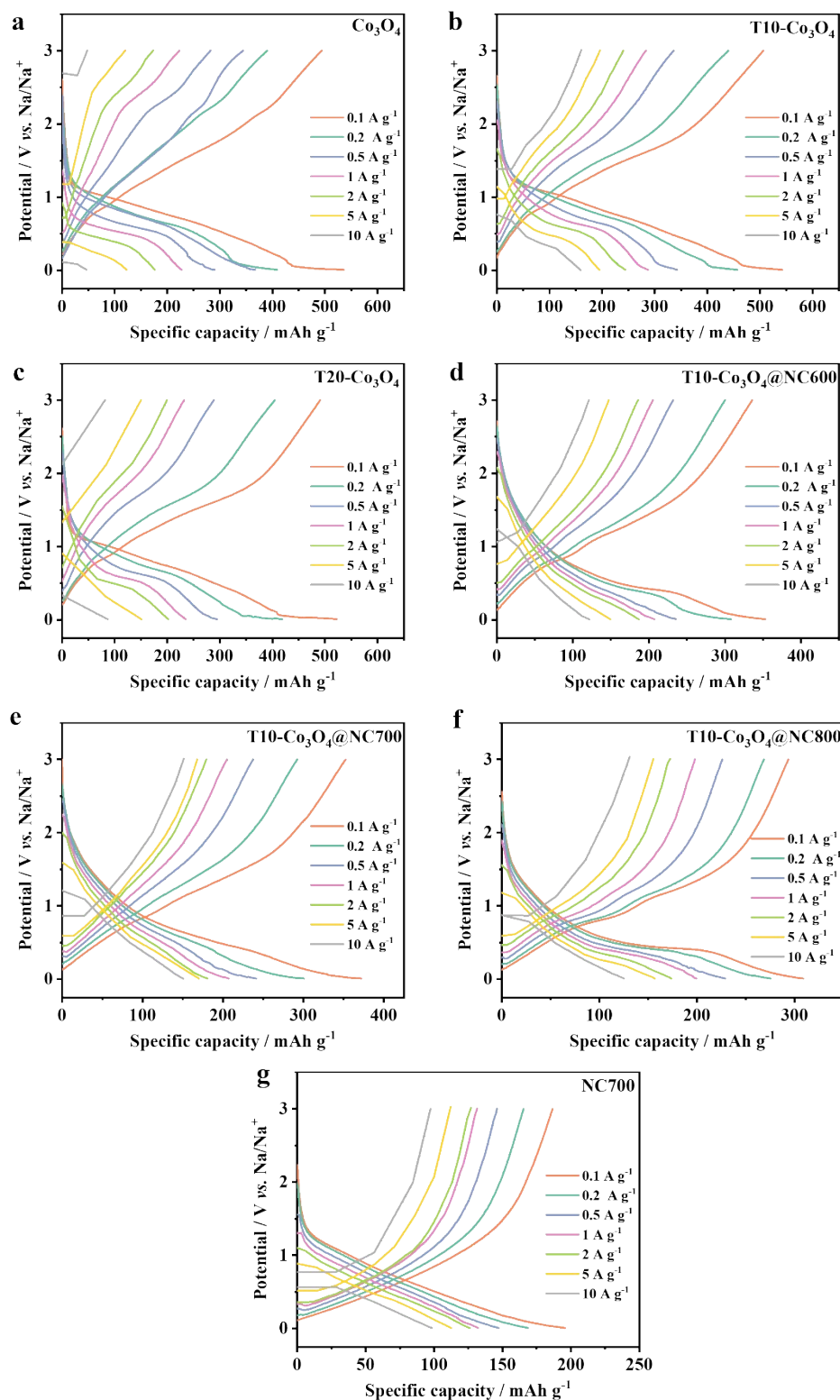


Fig. S6. GCD curves of (a) Co₃O₄, (b) T10-Co₃O₄, (c) T20-Co₃O₄, (d) T10-Co₃O₄@NC600, (e) T10-Co₃O₄@NC800, (f) T10-Co₃O₄@NC700 and (g) NC700 electrodes for the respective 5th cycle at 0.1-10 A g⁻¹.

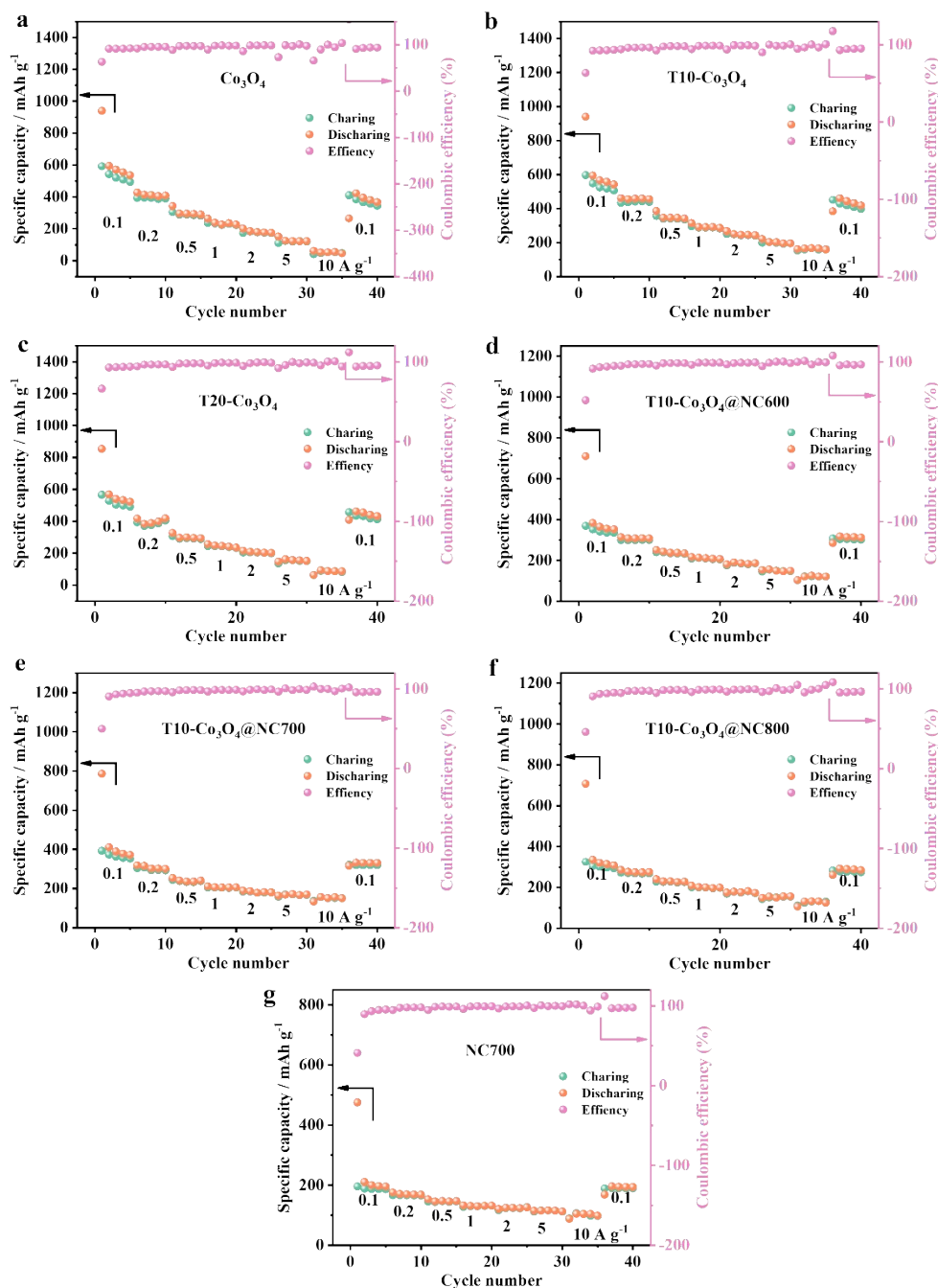


Fig. S7. Rate capability and coulombic efficiency of (a) Co₃O₄, (b) T10-Co₃O₄, (c) T20-Co₃O₄, (d) T10-Co₃O₄@NC600, (e) T10-Co₃O₄@NC800, (e) T10-Co₃O₄@NC700 and (g) NC700 electrodes at 0.1-10 A g⁻¹.

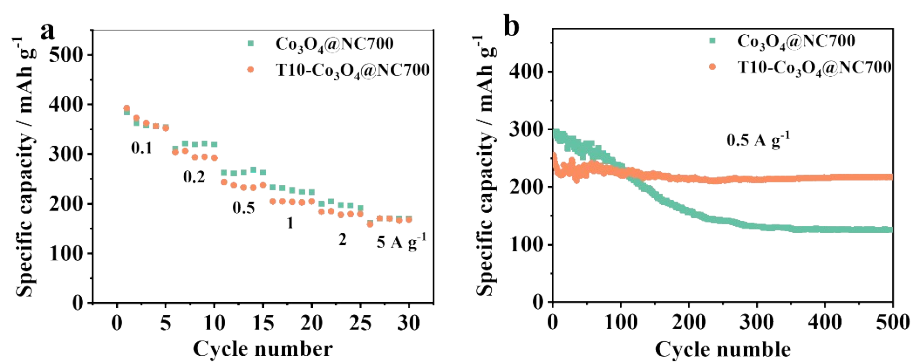


Fig. S8. (a) Rate capability and (b) cycling life of $\text{Co}_3\text{O}_4@\text{NC700}$ and $\text{T10-Co}_3\text{O}_4@\text{NC700}$.

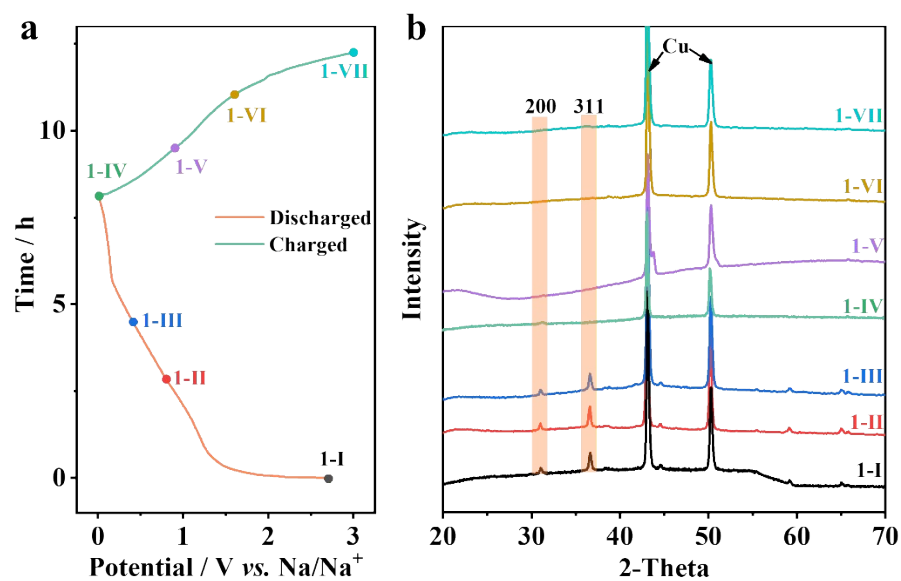


Fig. S9. (a) GCD plots of the first cycle, and (b) Ex-situ XRD of T10-Co₃O₄@NC700 electrode at different potentials.

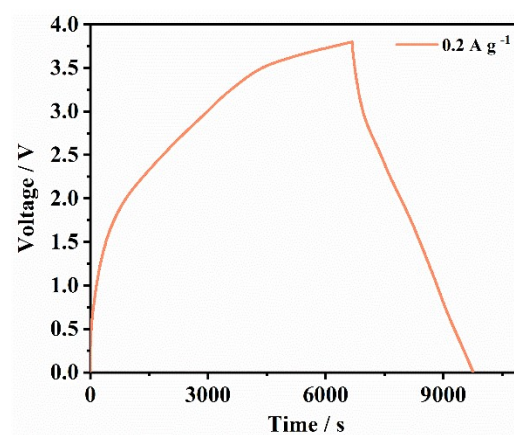


Fig. S10. GCD curves at 0.2 A g^{-1} of T10- Co_3O_4 @NC700//AC SIC.

Table S1. A comparison for the performance of the T10-Co₃O₄@NC700//AC in this work with some representative SICs.

SIC devices	Energy density (Wh/kg)	Power density (W/kg)	Capacitance retention/ cycles	Ref.
T-Nb ₂ O ₅ -C- rGO/rGO//AC/rGO	40	436	70%/2000	1
AC//Na-HC	35	1000	83%/5000	2
NiF ₂ //AC	35.1	500	73.6%/200	3
Cu _{1.8} Se/C-450//AC	65.8	81.4	75.3%/3000	4
CoSeO ₃ //AC	51	2000	72%/3000	5
MWTOG/AC	64.2	56.3	90%/10000	6
T10-Co ₃ O ₄ @NC700//AC	59-3.6	69-4145	50%/5000	This work

Supplementary References.

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