

## Supporting Information

### **Efficient amplification strategy for N-doped NiCo<sub>2</sub>O<sub>4</sub> with oxygen vacancies and partially Ni/Co-nitrides as a dual-functional electrode for both supercapattery and hydrogen electrocatalysis**

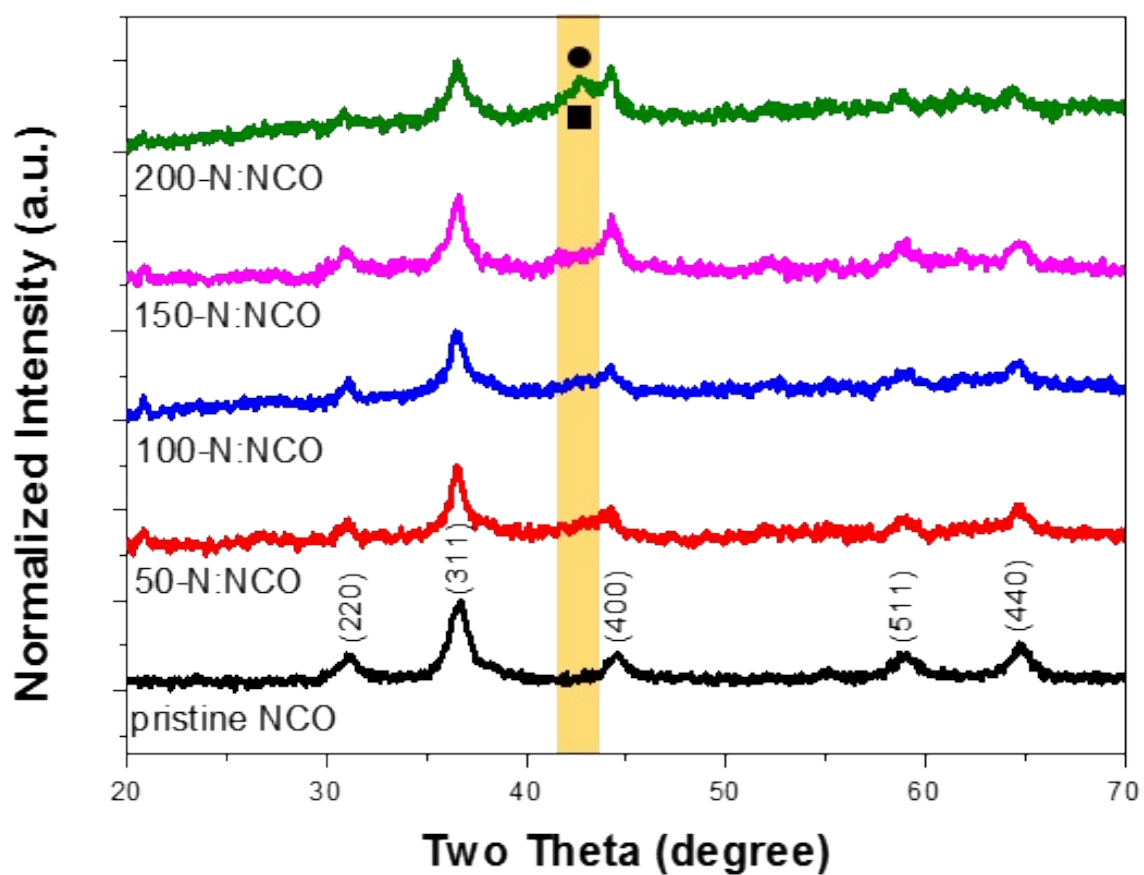
Keorock Choi,<sup>a,†</sup> In Kyu Moon,<sup>b,†</sup> and Jungwoo Oh<sup>\*a</sup>

<sup>a</sup>School of Integrated Technology and Yonsei Institute of Convergence Technology, Yeonsu-gu, Incheon 21983, Republic of Korea

<sup>b</sup>Yonsei Institute of Convergence Technology, Yonsei University, Yeonsu-gu, Incheon 21983, Republic of Korea.

\*Corresponding author. [jungwoo.oh@yonsei.ac.kr](mailto:jungwoo.oh@yonsei.ac.kr)

<sup>†</sup>I.K. Moon and K. Choi contributed equally to this work.



**Fig. S1.** XRD patterns of pristine NCO and N-doped NCO electrodes. Symbols indicate diffraction peaks from Ni- (JCPDS No.10-0280) and Co-nitrides (JCPDS No. 15-0806).

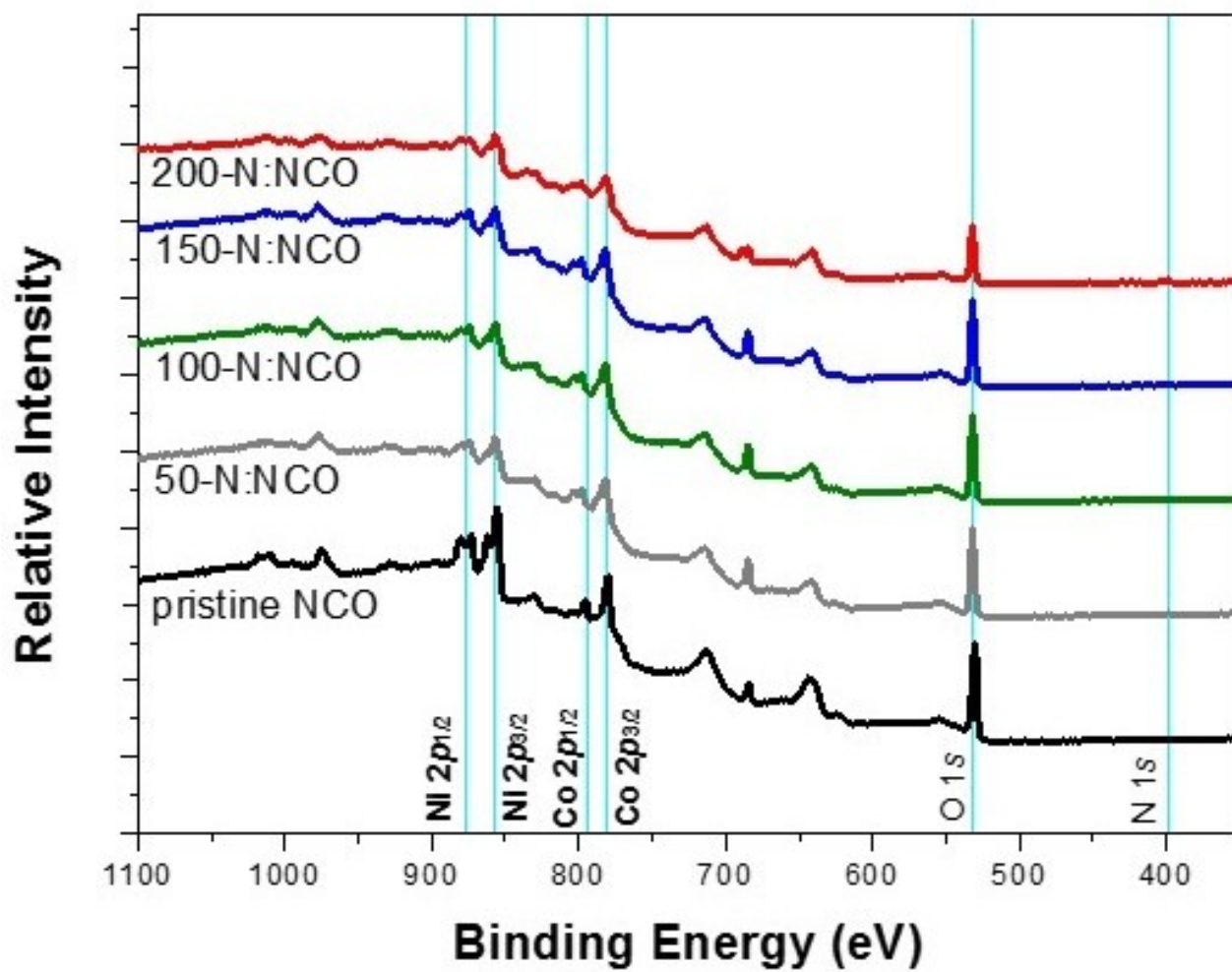
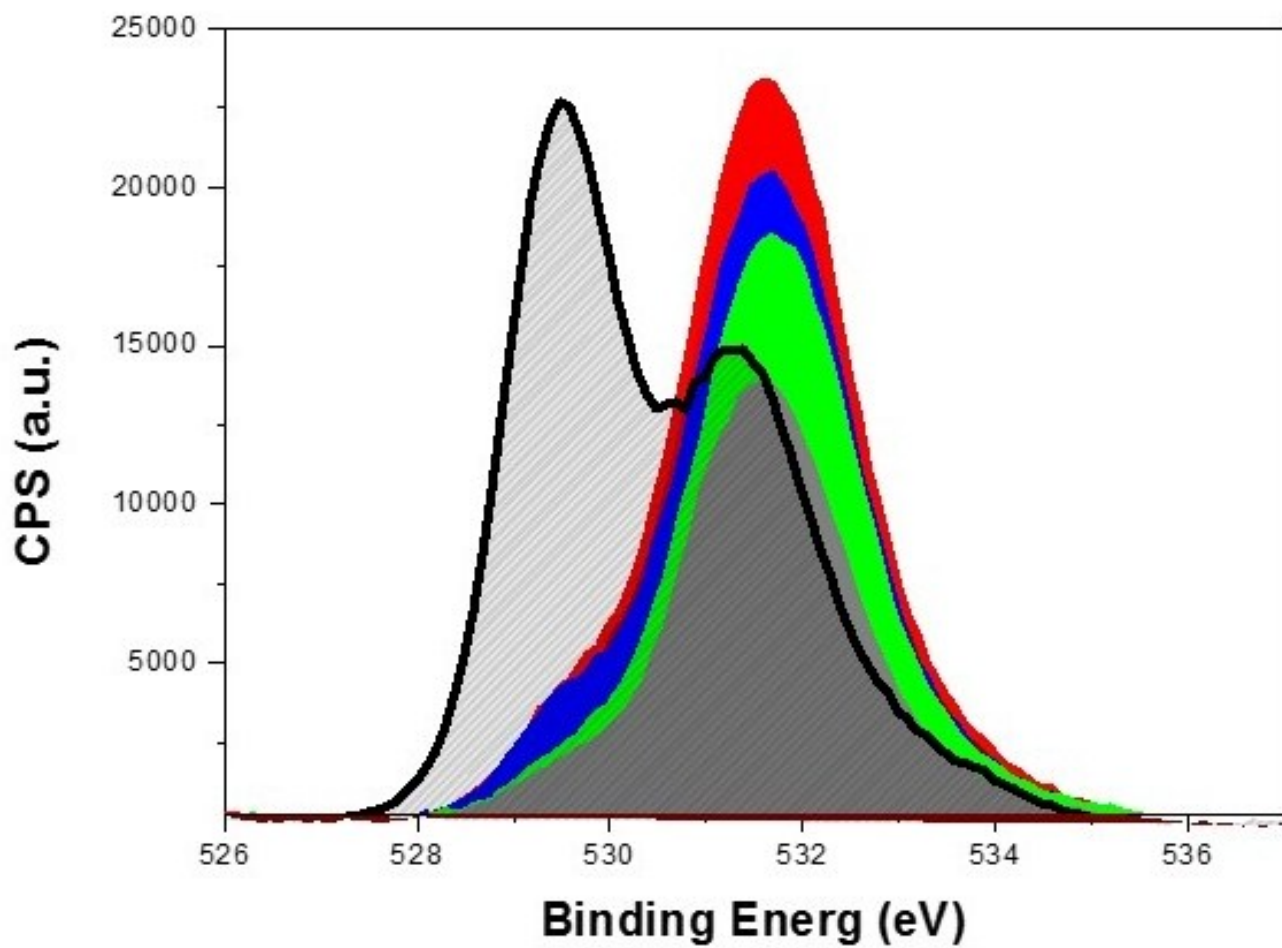
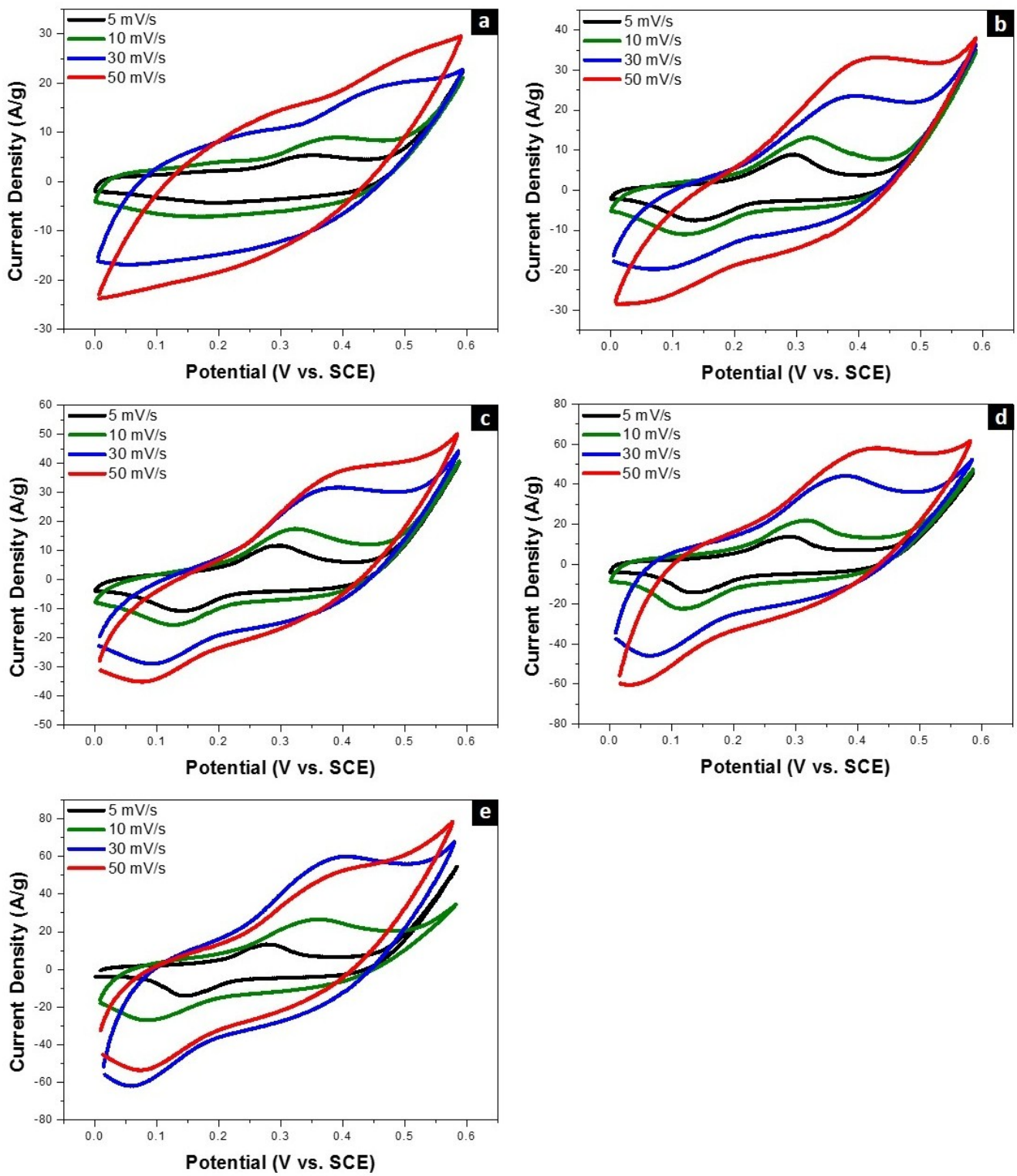


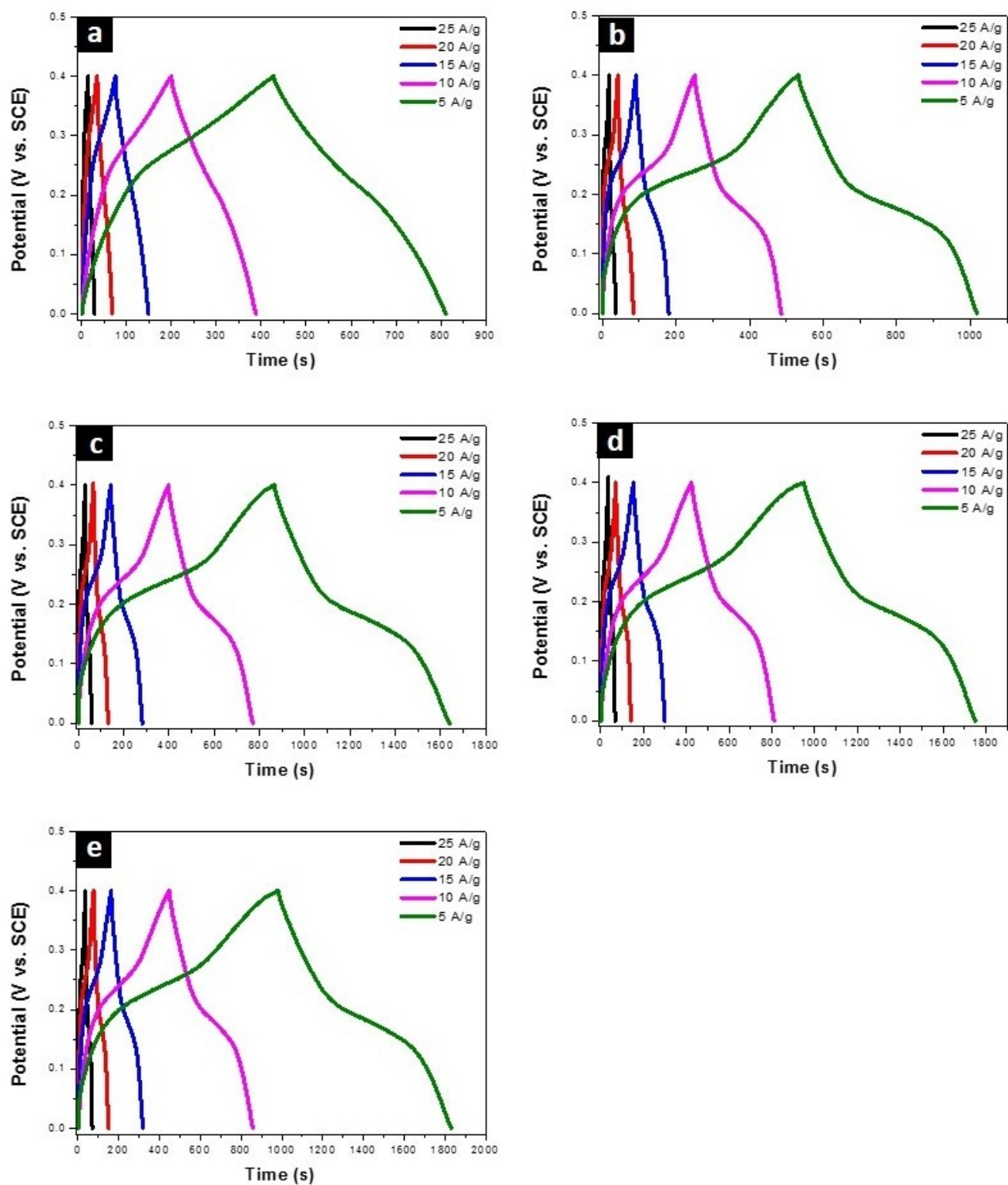
Fig. S2. XPS survey spectra of pristine NCO and N-doped NCO electrodes.



**Fig. S3.** High resolution XPS O 1s spectra of pristine NCO and N-doped NCO electrodes.



**Fig. S4.** CV curves of pristine NCO and N-doped NCO electrode at various scan rates.



**Fig. S5.** GCD curves of pristine NCO and N-doped NCO electrode at various current densities.

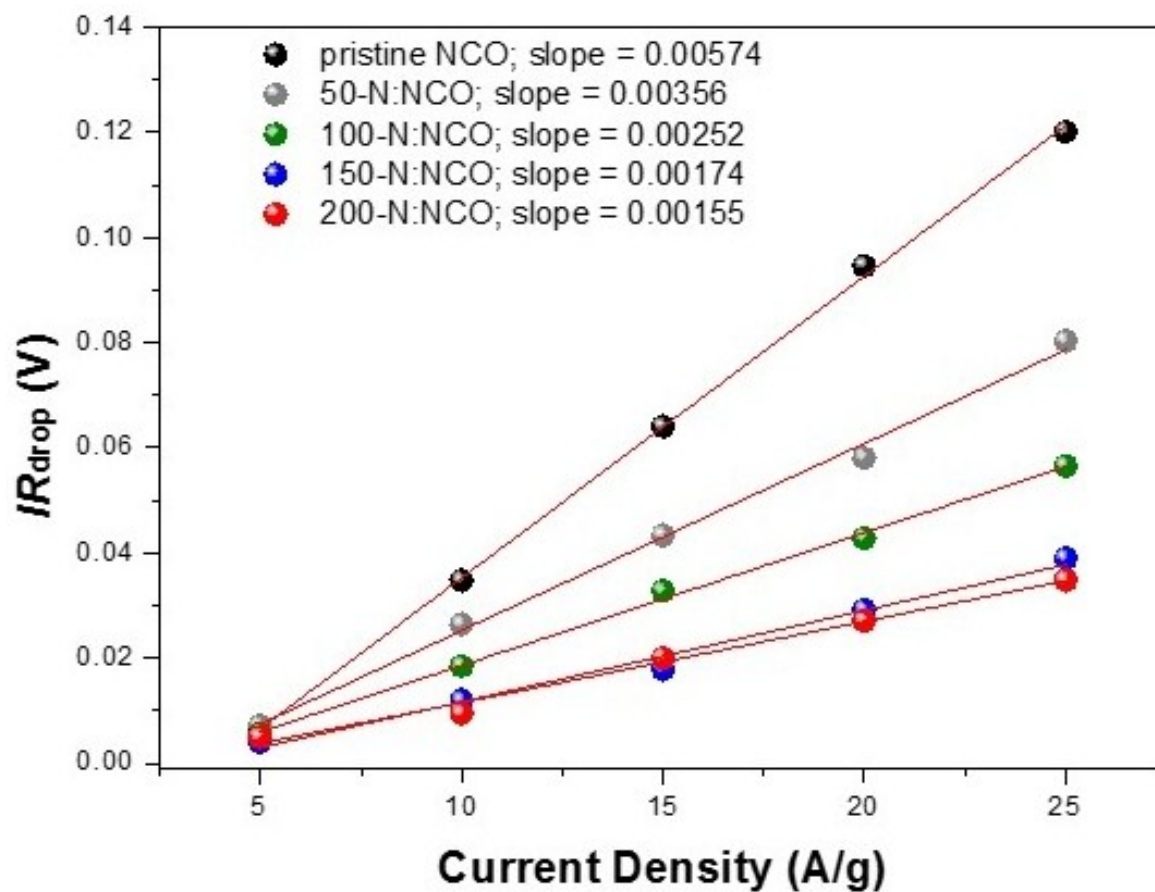
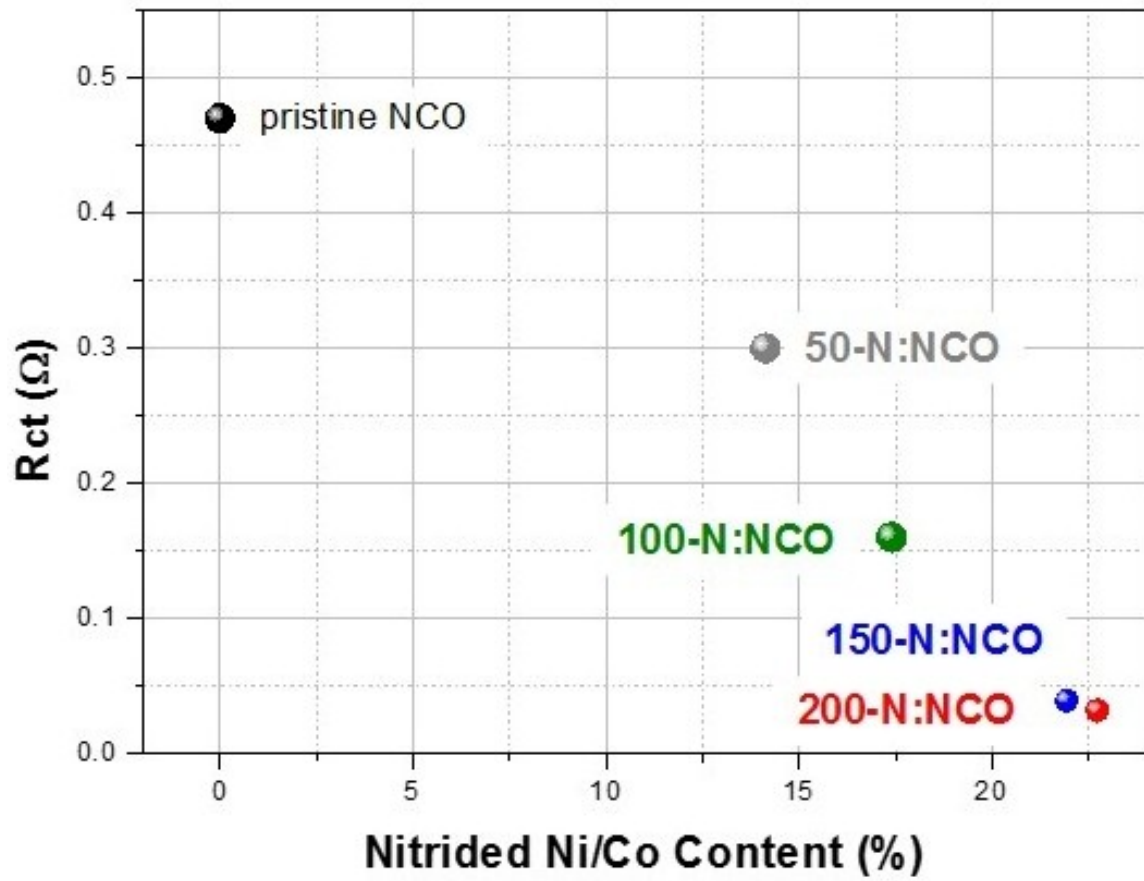
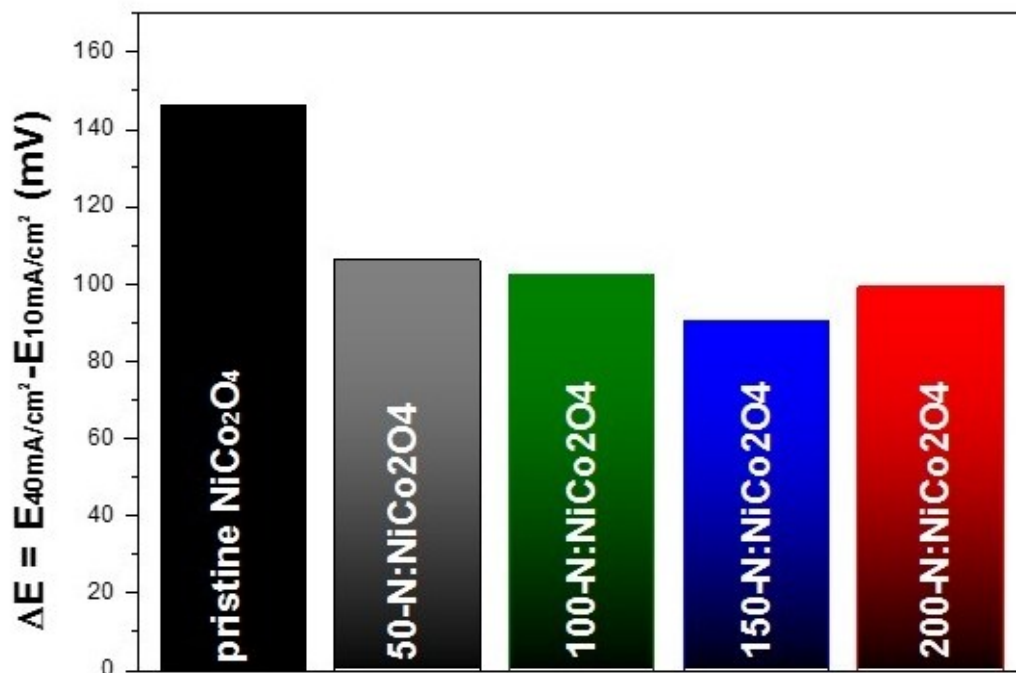


Fig. S6. Plot of potential drop vs. applied current density.

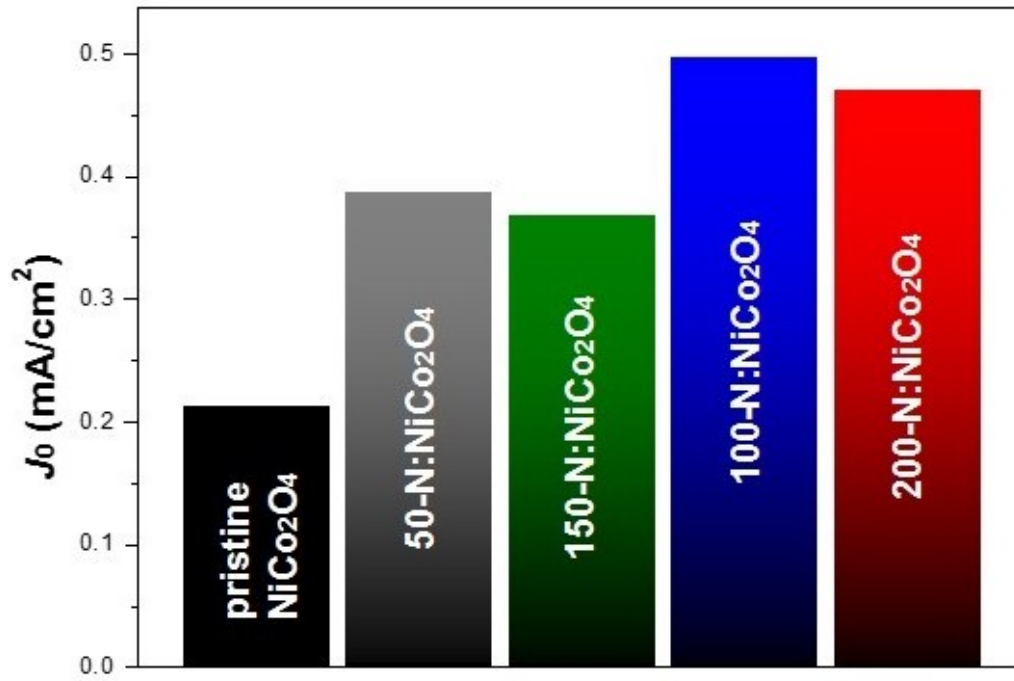


**Fig. S7.** Plot of Rct vs. nitrided Ni/Co content.





**Fig. S8.** The potential difference ( $\Delta E = E_{40\text{mA}\cdot\text{cm}^{-2}} - E_{10\text{mA}\cdot\text{cm}^{-2}}$ ) of pristine NCO and N-doped NCO electrodes.



**Fig. S9.** Comparison of calculated exchange current densities to measured values.

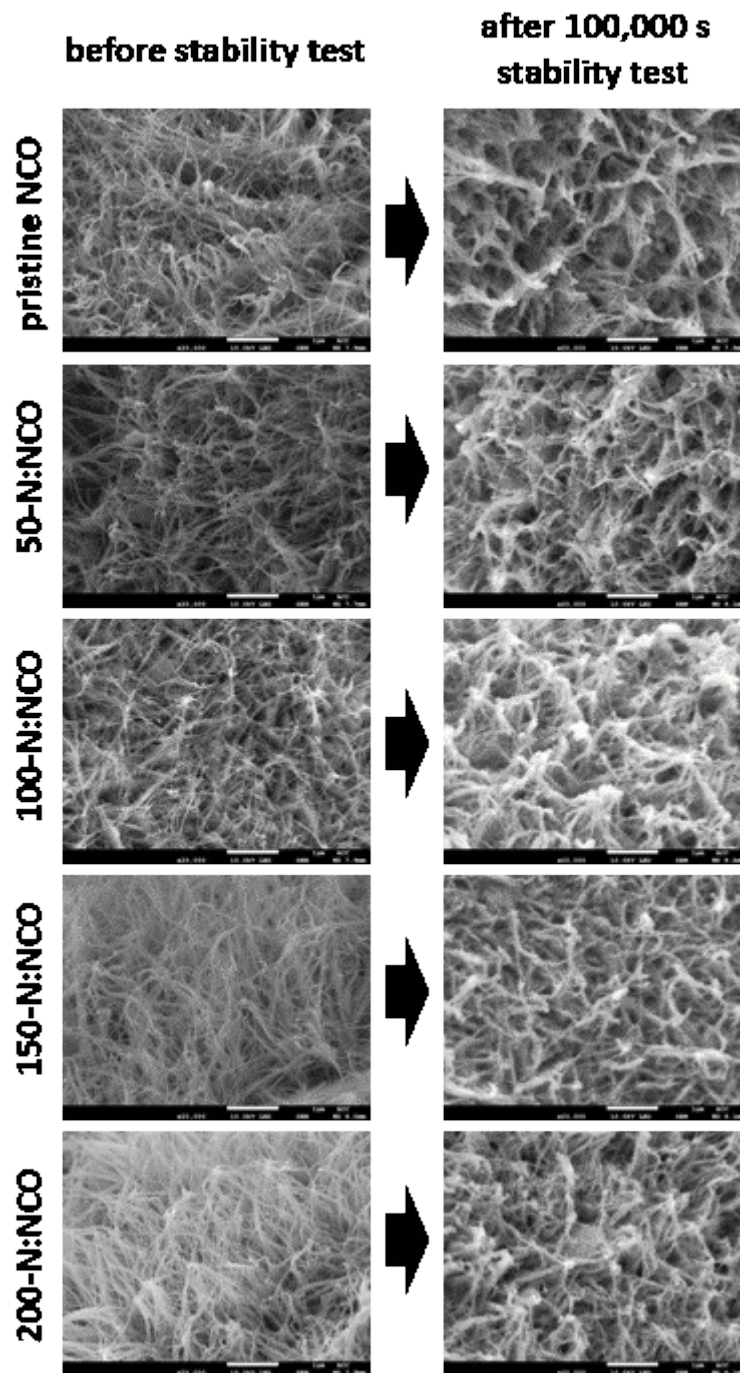
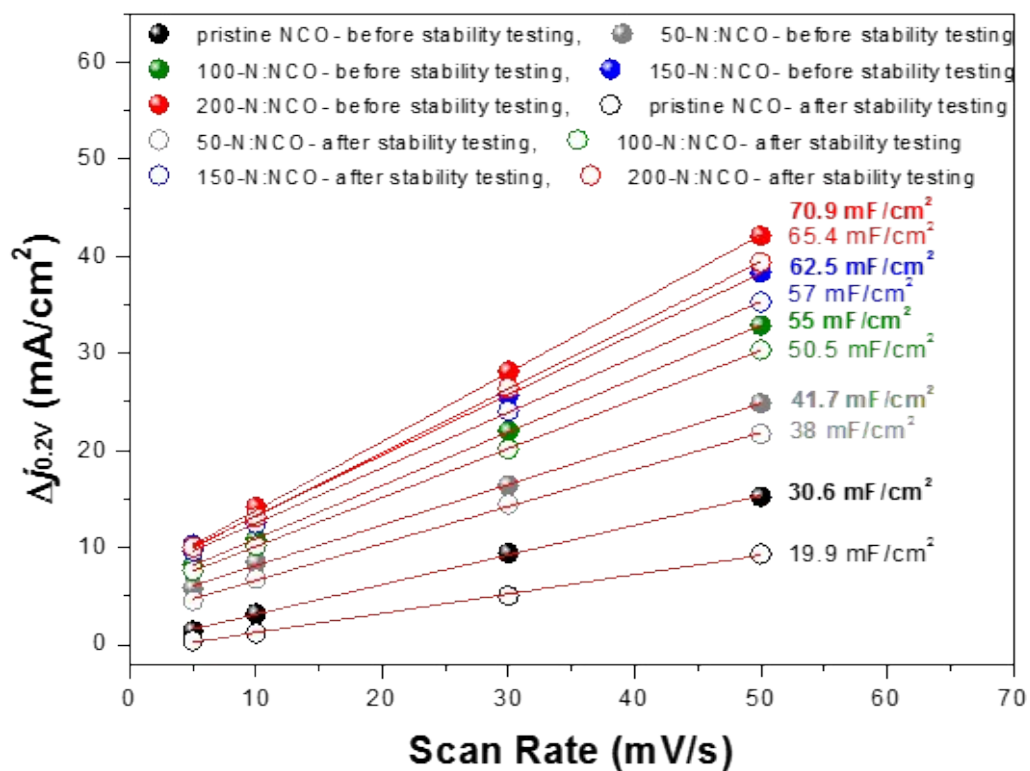


Fig. S10. (a) SEM images of NCO electrodes before and after 100,000 s stability test.



**Fig. S11.**  $C_{dl}$  measurement linear fitting of the capacitive currents against the scan rate to fit a linear regression.