Electronic Supplementary Material (ESI) for Materials Chemistry Frontiers.

Modulating the kinetics of $CoSe_2$ yolk-shell spheres via nitrogen doping with high pseudocapacitance toward ultra-high-rate and high-energy density sodium-ion half/full batteries

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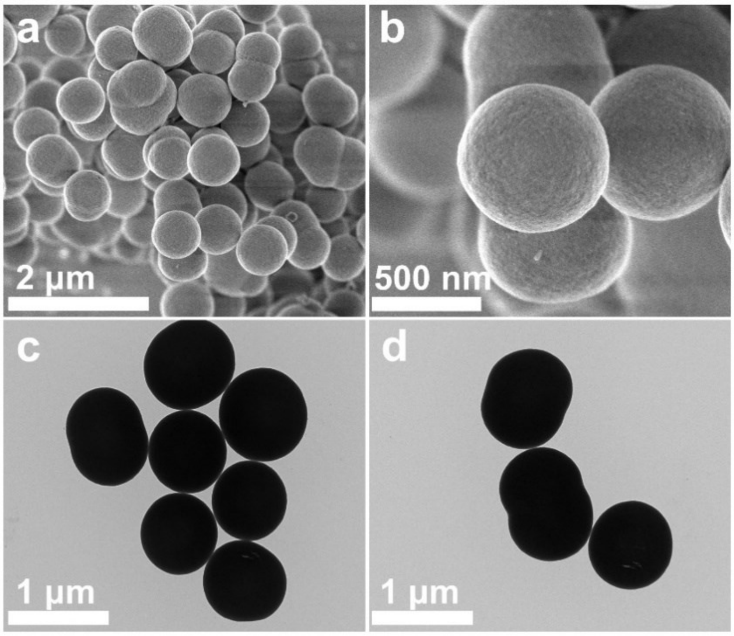

Fig. S1. (a, b) SEM images, (c, d) TEM images of the Co precursor.

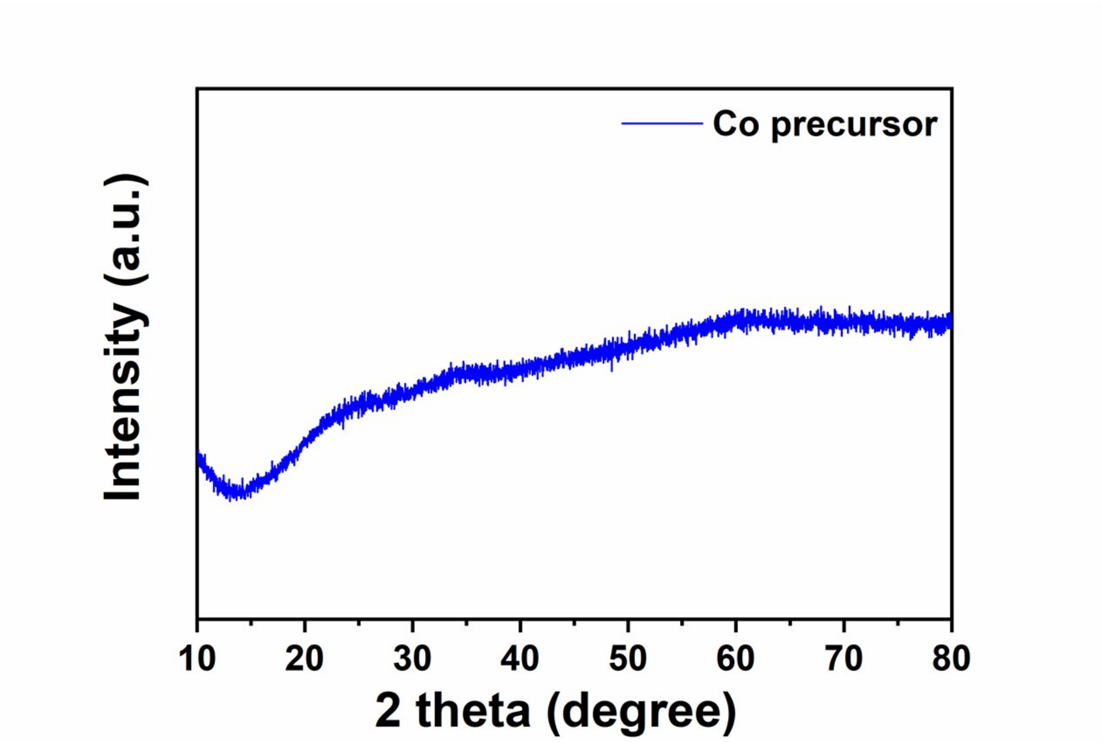

Fig. S2. XRD pattern of the Co precursor.

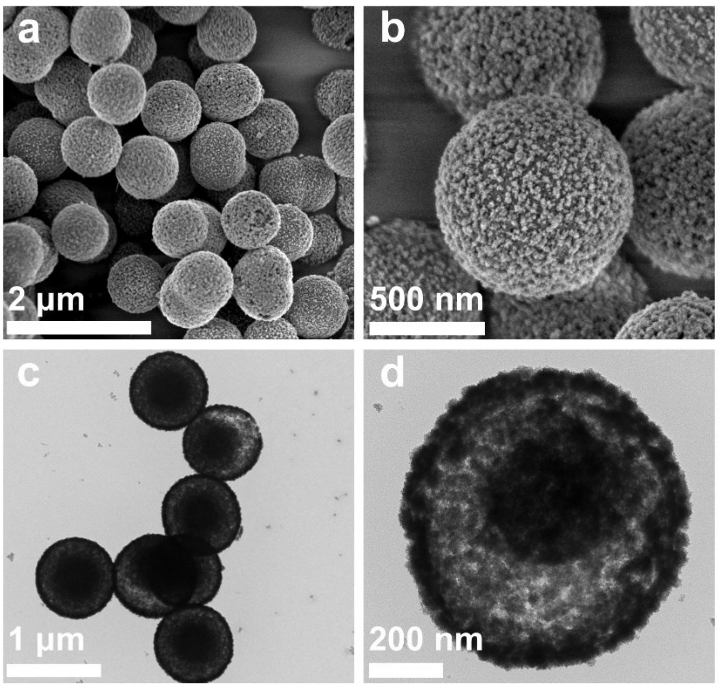

Fig. S3. (a, b) SEM images, (c, d) TEM images of the N-Co precursor.

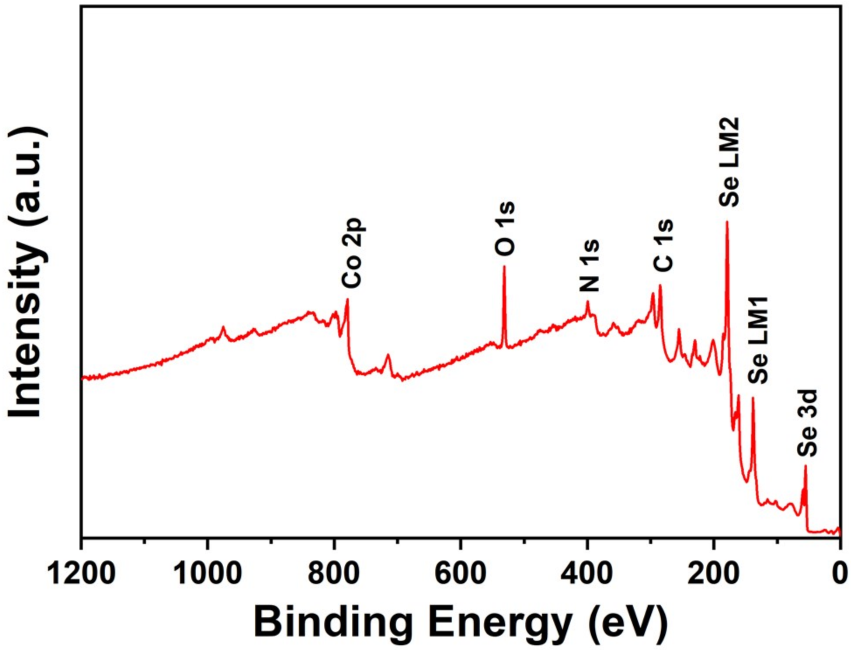

Fig. S4. XPS survey spectrum of the N-$CoSe_2$ yss.

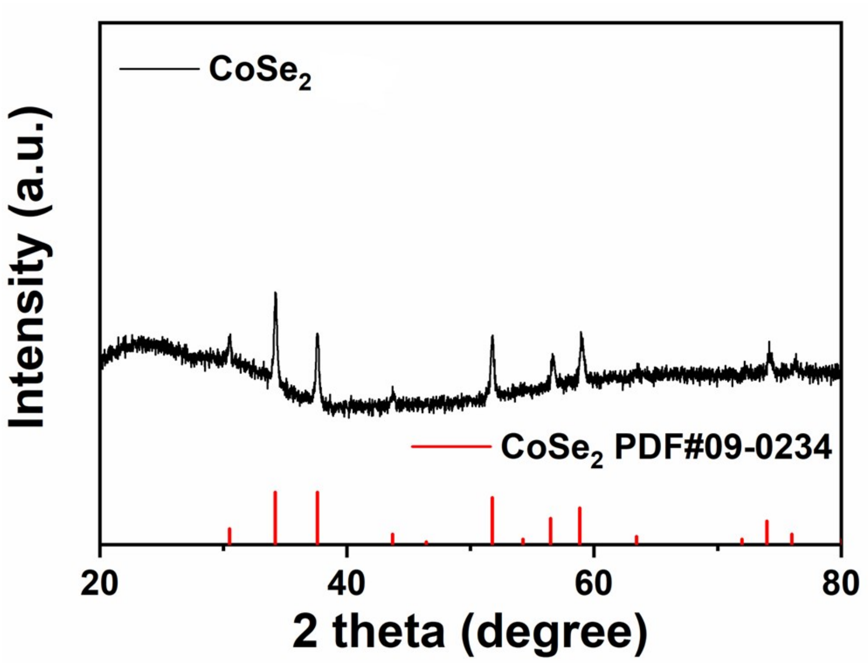

Fig. S5. XRD pattern of the $CoSe_2$.

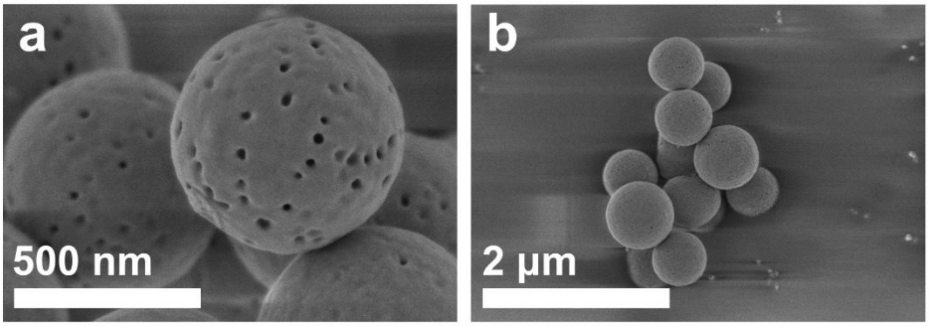

Fig. S6. (a, b) SEM images of the $CoSe_2$.

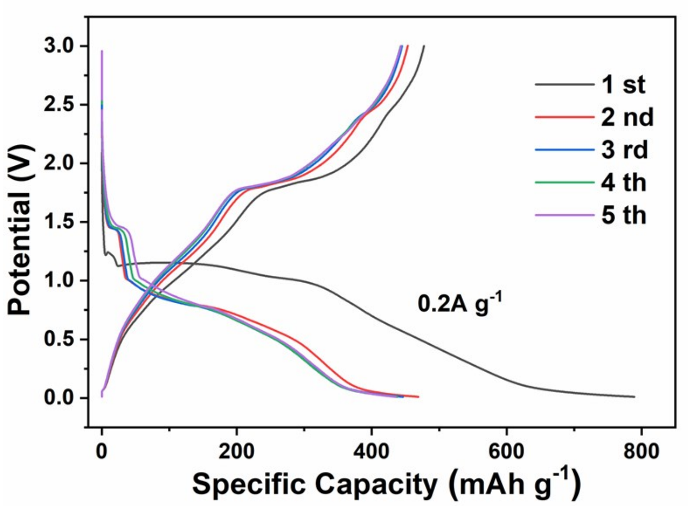

Fig. S7. The initial five discharge/charge profiles of $CoSe_2$ yss at the current density of 0.2 A g^{-1}.

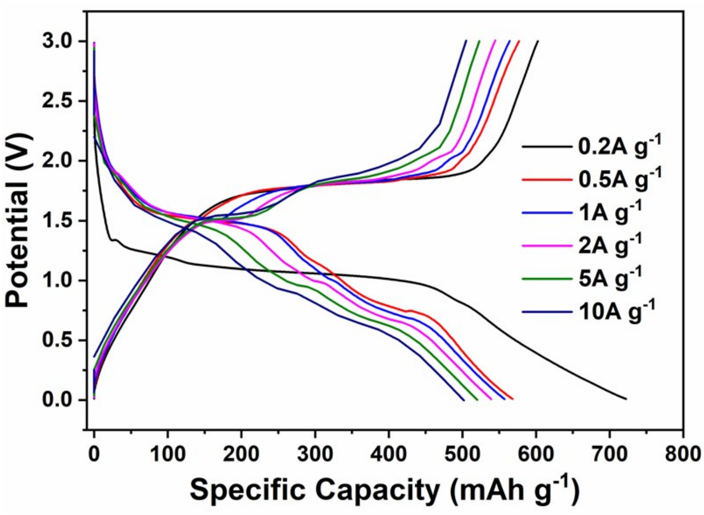

Fig. S8. The discharge/charge profiles of N-$CoSe_2$ yss at different current densities.

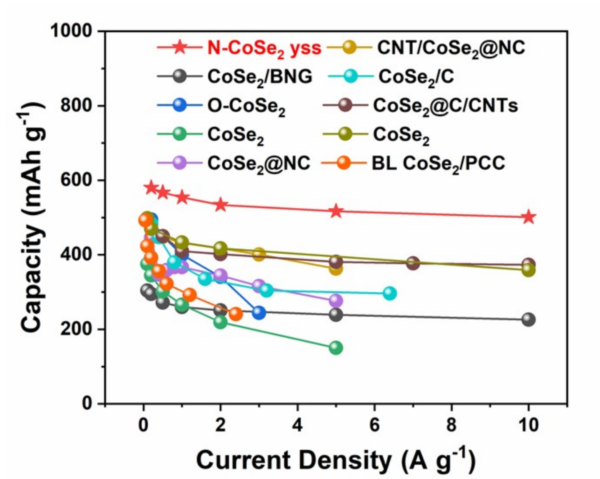

Fig. S9. The comparison of capacity between N-$CoSe_2$ yss and other $CoSe_2$-based materials at different current densities [S1-S9].

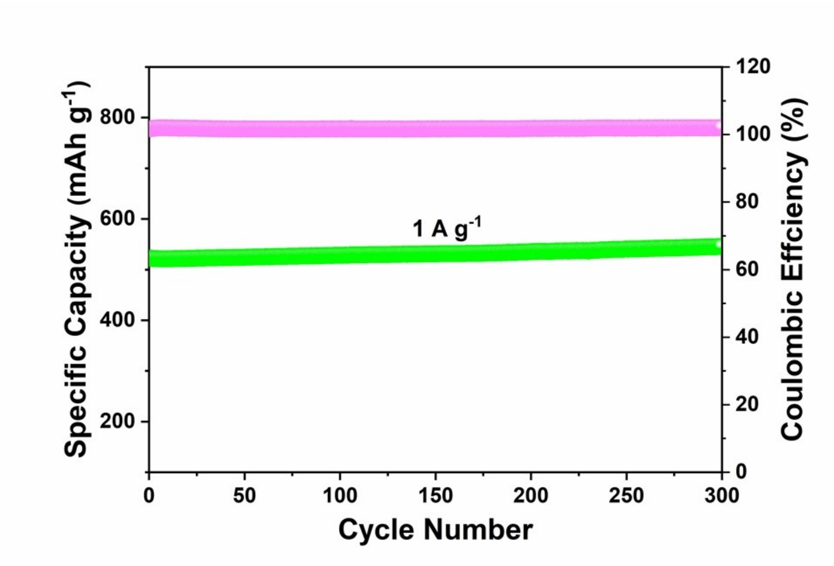

Fig. S10. Cycling property of N-$CoSe_2$ yss under the current density of 1.0 A g^{-1}.

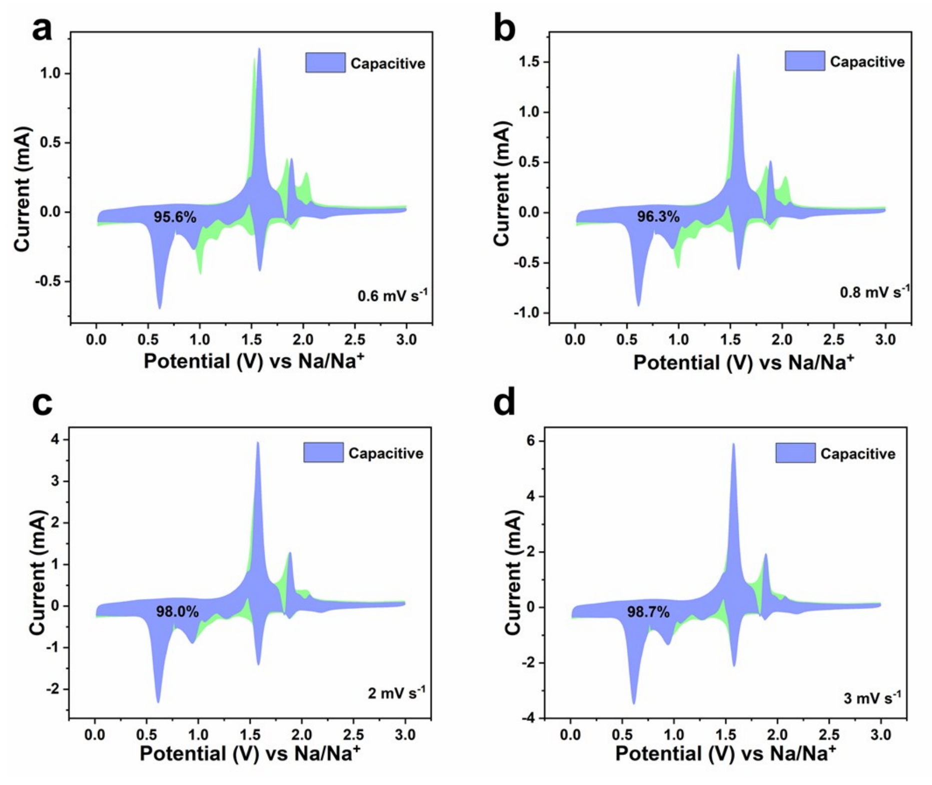

Fig. S11. Separation of the capacitive (shaded region) and diffusion currents at different scan rates.

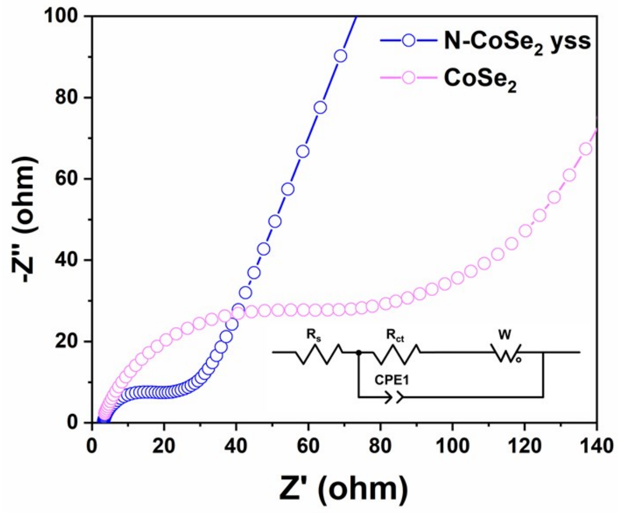

Fig. S12. Nyquist plots of the $CoSe_2$ and N-$CoSe_2$ yss electrode. The inset is corresponding equivalent circuit. R_s is the ohmic resistance, R_{ct} is the charge transfer resistance, CPE_1 is the constant phase element, and W is the Warburg impedance. The fitted result shows that the R_{ct} value of the N-$CoSe_2$ yss electrode is 14.0 Ω, which was much lower than that of the $CoSe_2$ electrode (60.2 Ω), indicating the much faster charge transport kinetics for N-$CoSe_2$ yss.

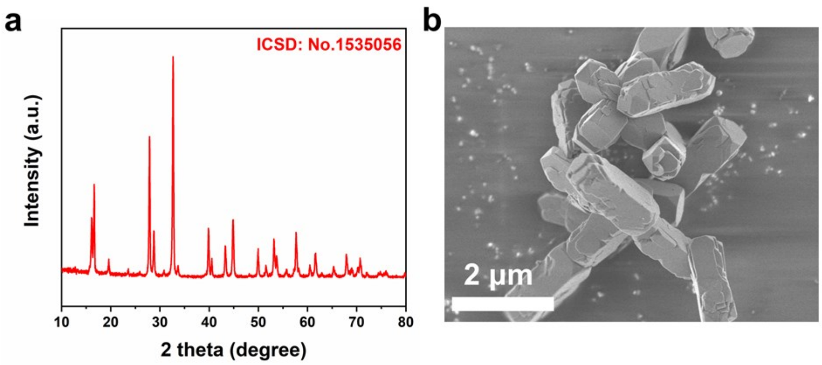

Fig. S13 (a) XRD pattern and (b) SEM image of the $Na_3V_2(PO_4)_2O_2F$.

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