Oxygen redox activity through a reductive coupling mechanism in the P3-type nickel-doped sodium manganese oxide

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Table S1. Rietveld refinement results for as-synthesized $Na_{0.67}Ni_{0.2}Mn_{0.8}O_2$

R_{exp} : 3.55 % R_{wp} : 4.23 % R_p : 3.45 % 98% P3 2% NiO

Space group *R3m* *a* =2.8650(1) Å *c* = 16.8159(16) Å

atom	Wyckoff symbol	x/a	y/b	z/c	Occupancy	Biso
Mn1/Ni1	3a	0	0	0	0.825/0.175(3)	0.3(2)
Na1	3a	0	0	0.167(2)	0.51(5)	4.6(7)
O1	3a	0	0	0.4004(13)	1	0.86(12)
O2	3a	0	0	0.6141(13)	1	1.5(2)

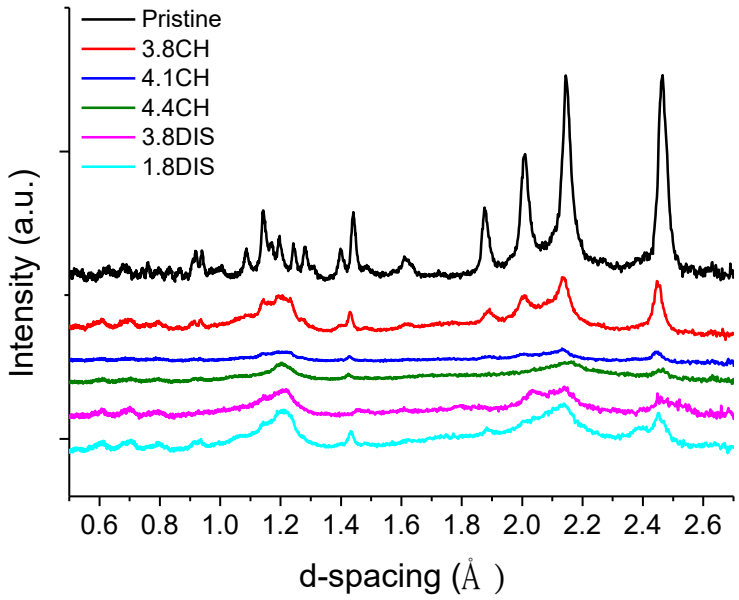

Figure S1. PND patterns for $Na_{0.67}Ni_{0.2}Mn_{0.8}O_2$ extracted at different states of charge.

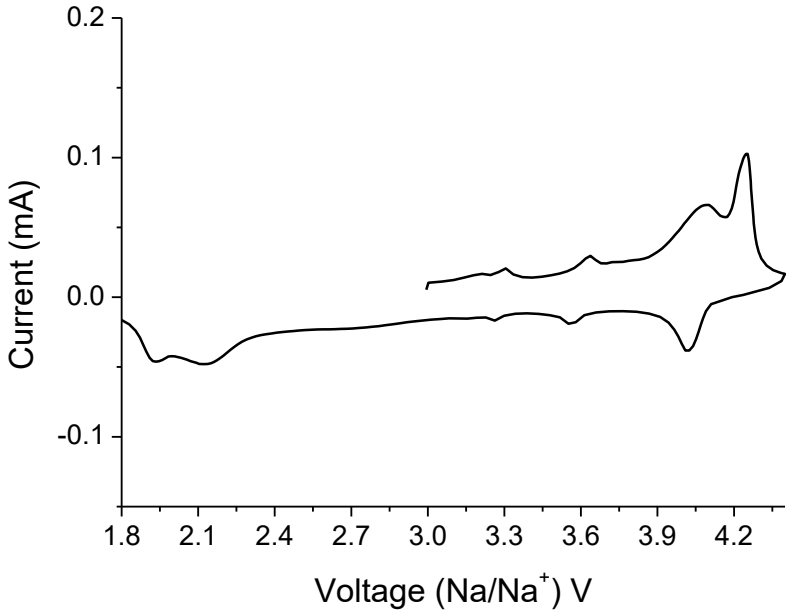

Figure S2. Voltammetric analysis of $Na_{0.67}Ni_{0.2}Mn_{0.8}O_2$ at a scan rate of 30 $\mu V\ s^{-1}$.

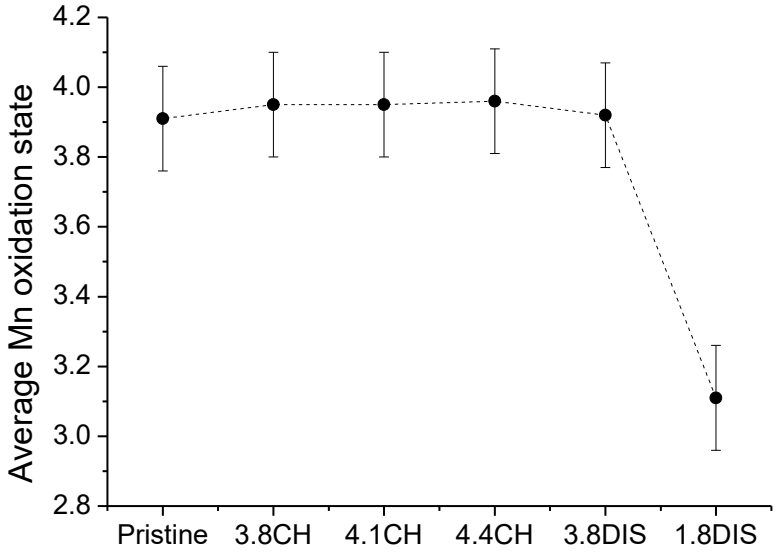

Figure S3. Variation of Mn oxidation state, calculated from the position of the centroid of the pre-edge for $Na_{0.67}Ni_{0.2}Mn_{0.8}O_2$ extracted at different states of charge.

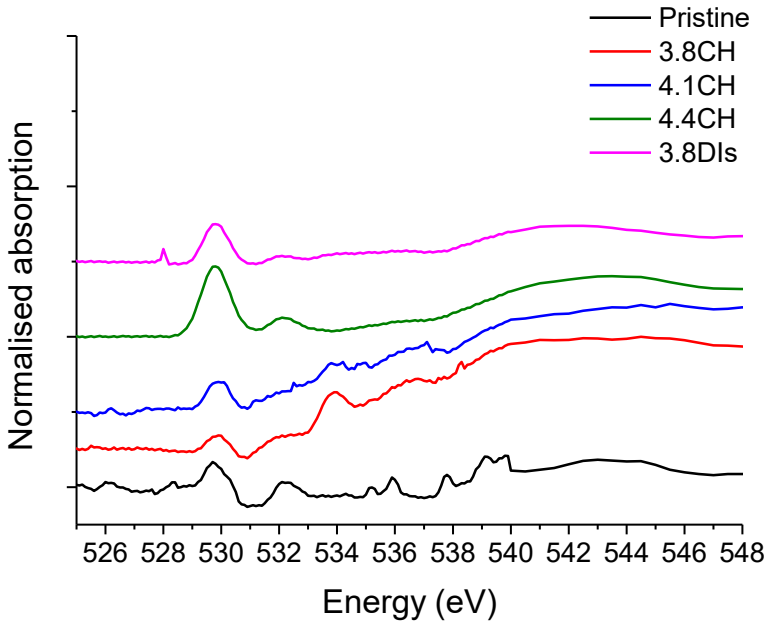

Figure S4. O K-edge SXAS spectra recorded in TEY mode for $Na_{0.67}Ni_{0.2}Mn_{0.8}O_2$ extracted at different states of charge.

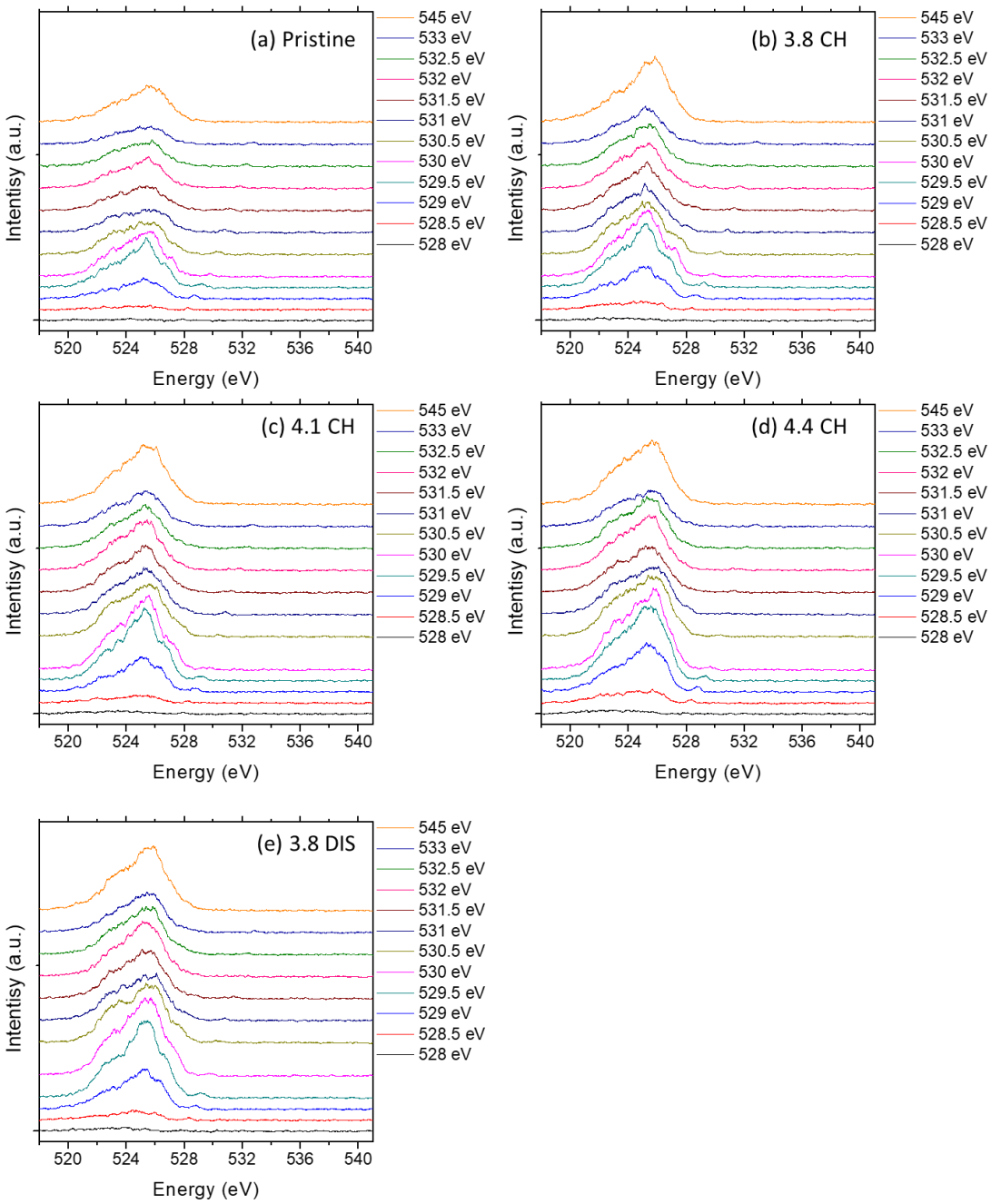

Figure S5. Complete overview of O K-edge RIXS spectra of $Na_{0.67}Ni_{0.2}Mn_{0.8}O_2$ extracted at different states of charge.