

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

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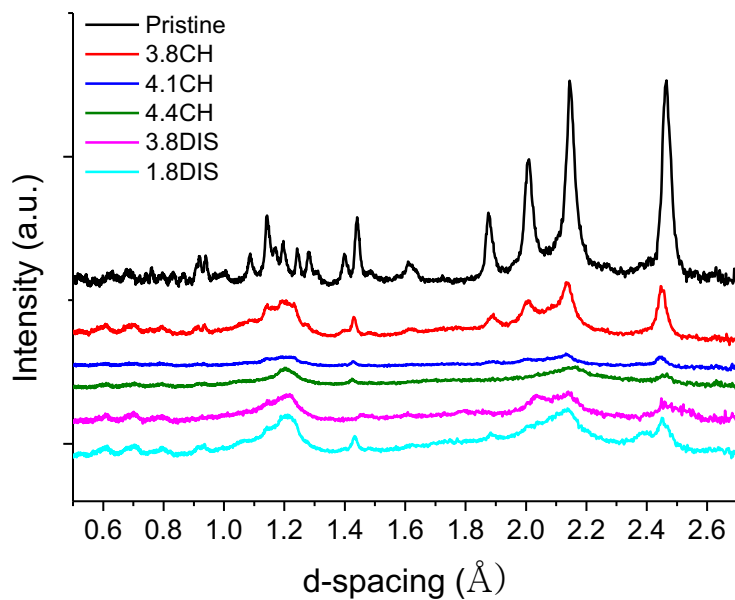
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Table S1. Rietveld refinement results for as-synthesized $\text{Na}_{0.67}\text{Ni}_{0.2}\text{Mn}_{0.8}\text{O}_2$

$R_{\text{exp}} : 3.55 \% R_{\text{wp}} : 4.23 \% R_{\text{p}} : 3.45 \% \quad 98\% \text{ P3 } 2\% \text{ NiO}$

Space group $R3m$ $a = 2.8650(1) \text{ \AA}$ $c = 16.8159(16) \text{ \AA}$

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 $\text{Na}_{0.67}\text{Ni}_{0.2}\text{Mn}_{0.8}\text{O}_2$ extracted at different states of charge.

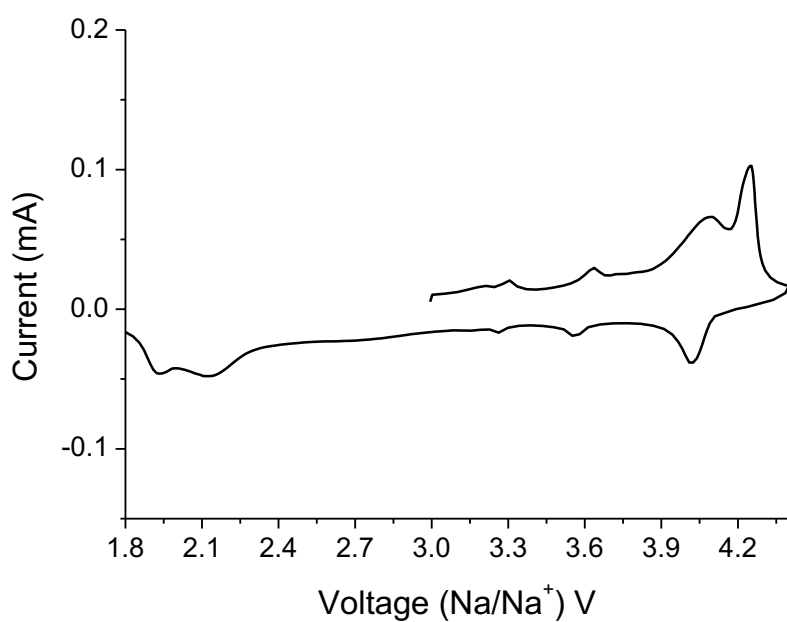


Figure S2. Voltammetric analysis of $\text{Na}_{0.67}\text{Ni}_{0.2}\text{Mn}_{0.8}\text{O}_2$ at a scan rate of $30 \mu\text{V s}^{-1}$.

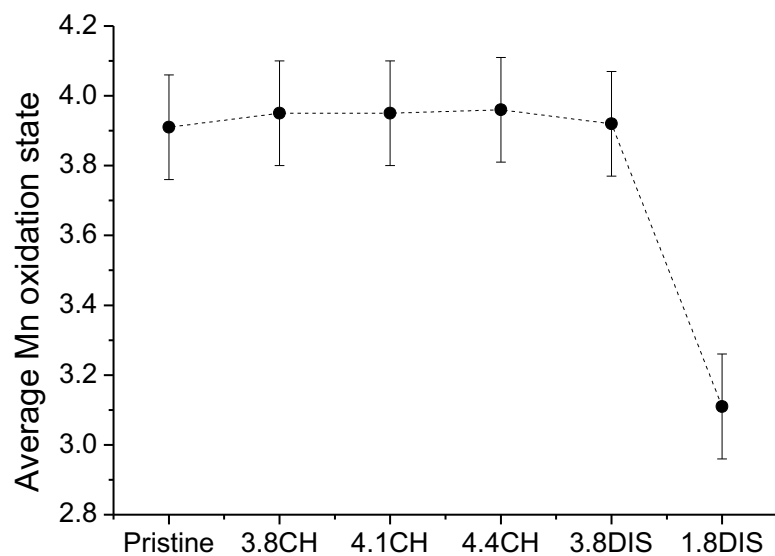


Figure S3. Variation of Mn oxidation state, calculated from the position of the centroid of the pre-edge for $\text{Na}_{0.67}\text{Ni}_{0.2}\text{Mn}_{0.8}\text{O}_2$ extracted at different states of charge.

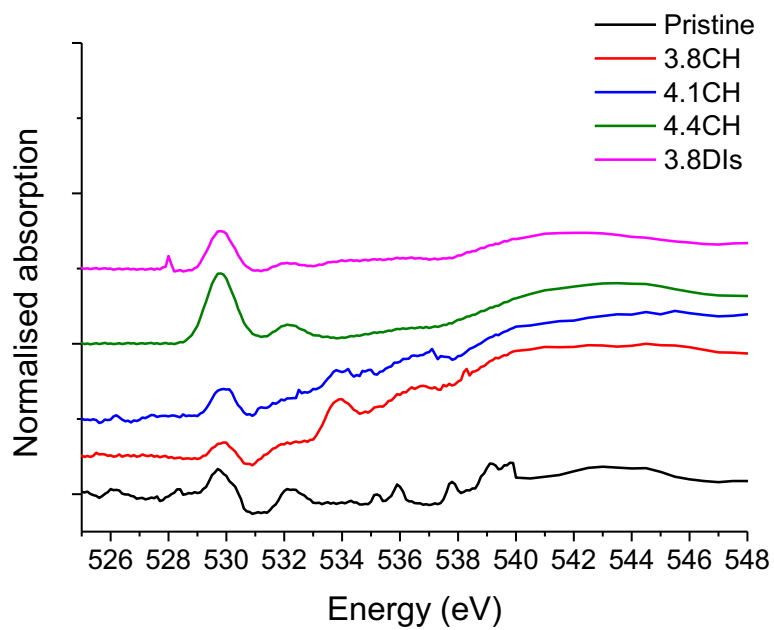


Figure S4. O K-edge SXAS spectra recorded in TEY mode for $\text{Na}_{0.67}\text{Ni}_{0.2}\text{Mn}_{0.8}\text{O}_2$ extracted at different states of charge.

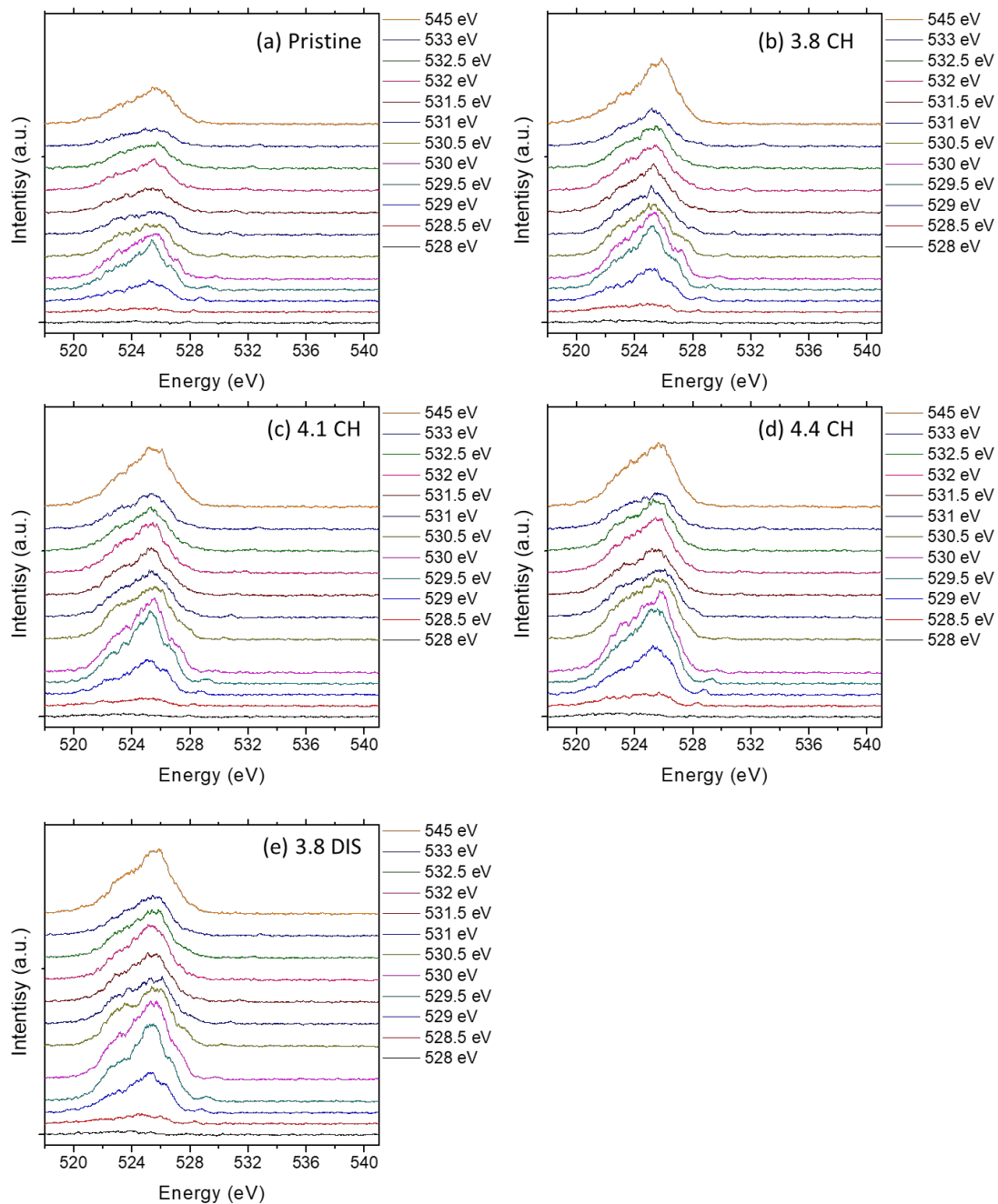


Figure S5. Complete overview of O K-edge RIXS spectra of $\text{Na}_{0.67}\text{Ni}_{0.2}\text{Mn}_{0.8}\text{O}_2$ extracted at different states of charge.