

Upcycling end-of-life cathode material into next generation cathode materials

R. Madge, A. Jarvis, W. Lima da Silva, L. L. Driscoll, P. A. Anderson and P. R. Slater

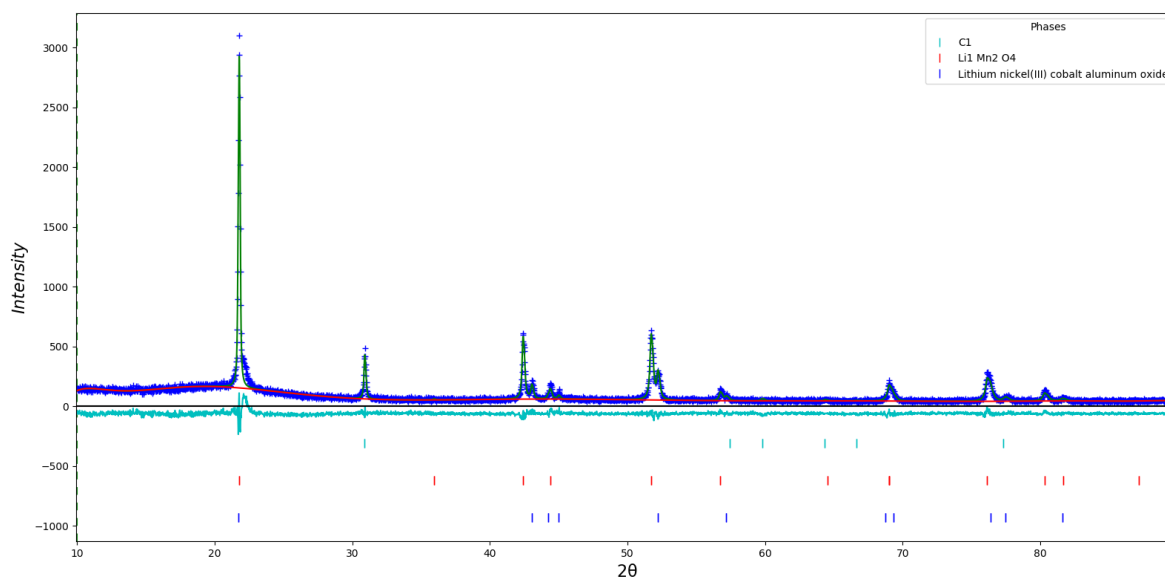


Figure S1: Rietveld refinement plot of end-of-life cathode.

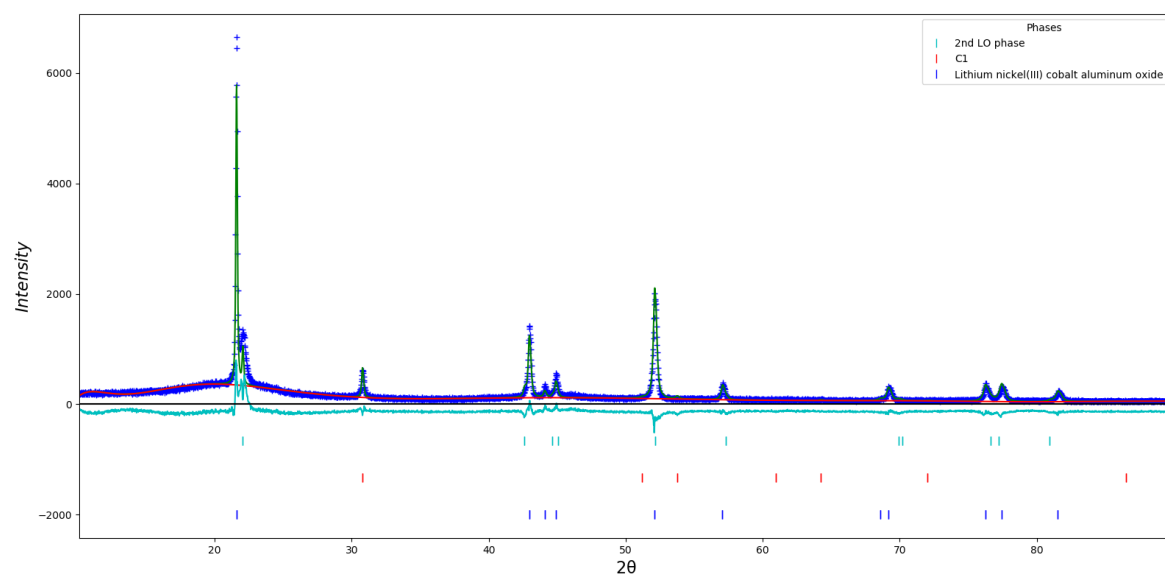


Figure S2: Rietveld refinement plot of end-of-life cathode after 20 mins of leaching.

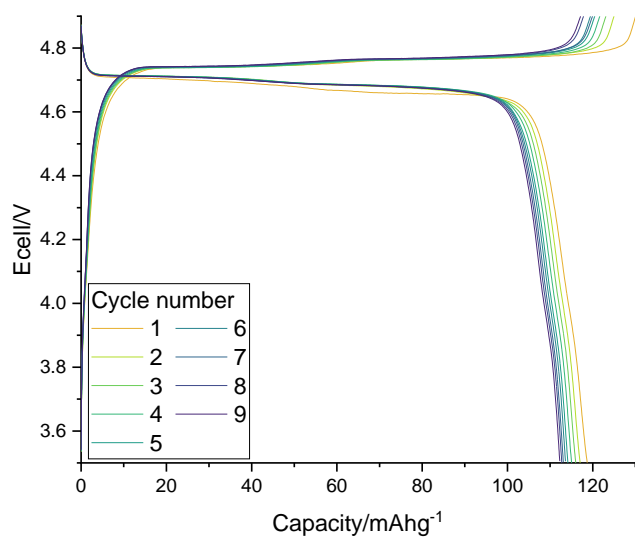


Figure S3: Galvanostatic charge-discharge profiles for $\text{LiMn}_{1.5}\text{Ni}_{0.5}\text{O}_4$ made from pristine starting materials. Cells were cycled at 10 mA g^{-1} between 3.5-4.9 V.

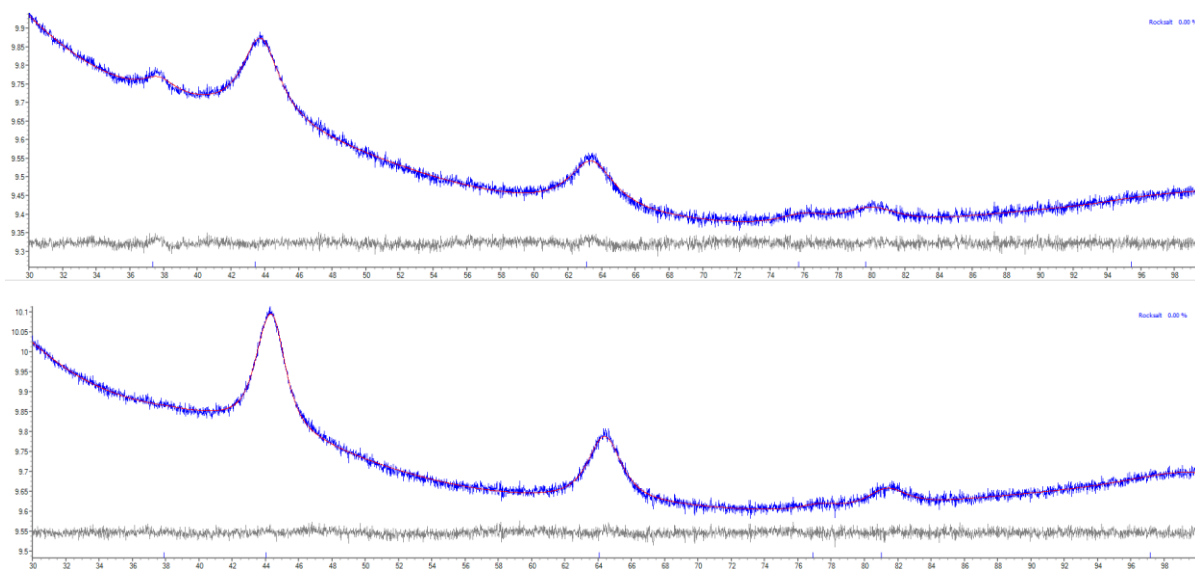


Figure S4: Pawley refinement plot of recovered of $\text{Li}_4\text{Mn}_2\text{O}_5$ (above) and $\text{Li}_2\text{MnO}_{2.25}\text{F}$ (below).

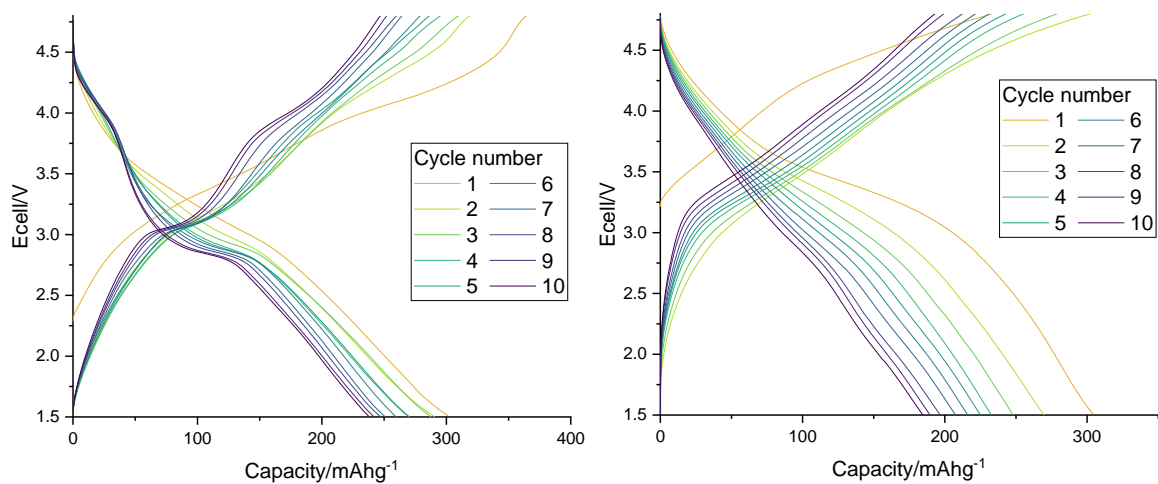


Figure S5: Galvanostatic charge-discharge profiles for Li₄Mn₂O₅ (left) and Li₂MnO_{2.25}F (right) made from pristine starting materials. Cells were cycled at 10 mA g⁻¹ between 1.5-4.8 V.

Table S1: Pawley refinement results for the lattice parameters of LiMn_2O_4 and layered oxide phase at different leaching times

Lattice parameters			
Leaching time/mins	LiMn ₂ O ₄ phase	Layered oxide phase	
	a/Å	a/Å	c/Å
0	8.208(4)	2.859(5)	14.263(1)
5	8.177(1)	2.857(6)	14.267(2)
10	8.201(2)	2.856(7)	14.273(4)
15	8.204(2)	2.859(4)	14.286(2)
20	/	2.857(3)	14.272(2)

Table S2: ICP-OES results showing the concentration of each element in solution at different leaching times

Concentration in solution/ppm					
Leaching time/mins	Li	Mn	Ni	Co	Al
5	436.95	4759.12	61.06	97.61	82.02
10	672.50	8804.06	90.41	174.25	128.30
15	852.90	12018.49	156.85	240.55	195.16
20	891.89	12571.27	287.72	273.18	220.88