Supporting Information

Bio-Derived Dimethyl Itaconate: A Sustainable, Low-Cost Electrolyte Additive for High-Performance Lithium Batteries

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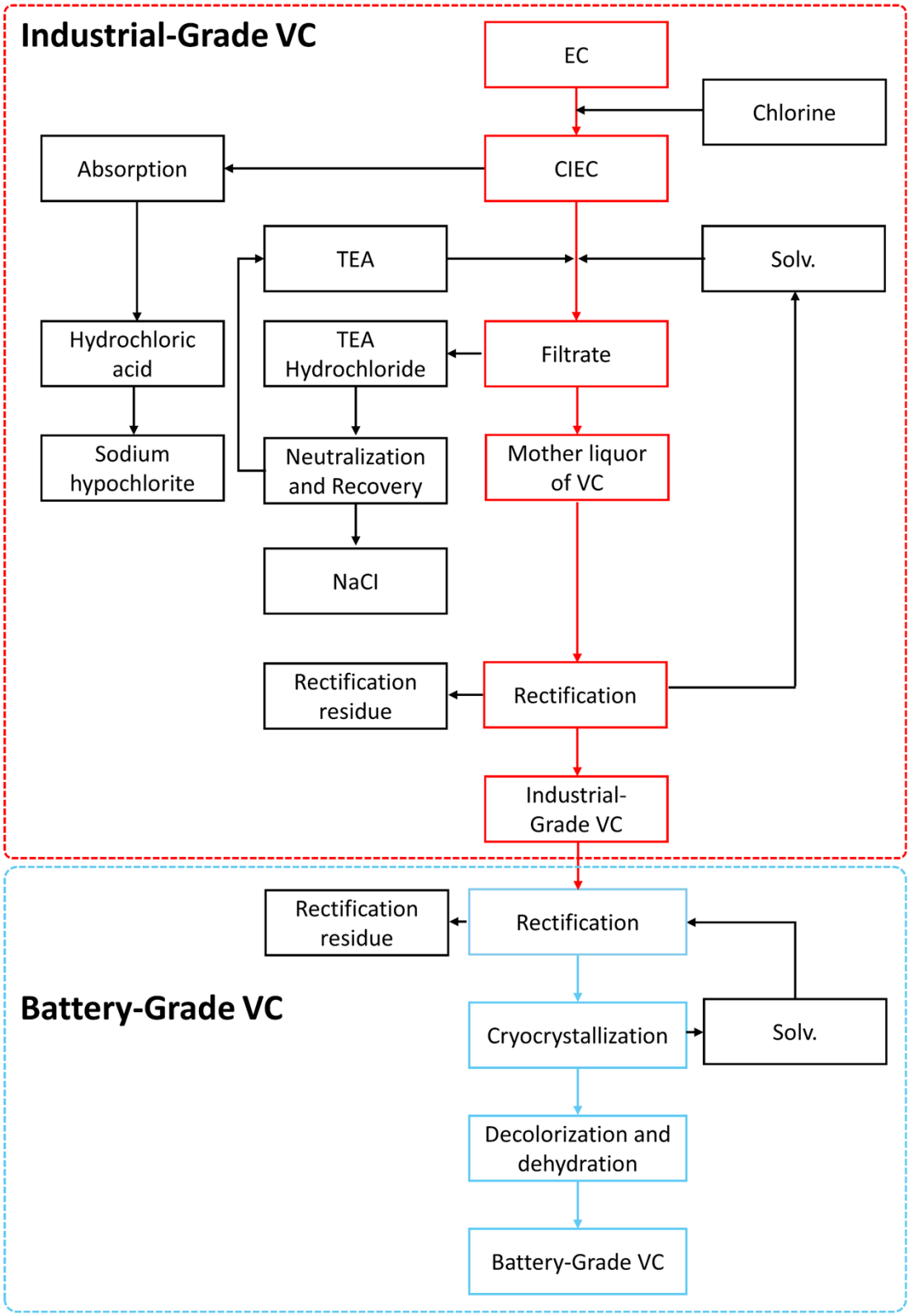

Figure S1 The production and purification of Battery-Grade VC.

Table S1 The comprehensive comparison between DMIC and VC (Safety Data Sheet from sigma-aldrich).

	VC	DMIC
Raw materials and sources	Petroleum-based, synthetic	Biomass-based (from itaconic acid via fermentation)
Production process	Multi-step, involves toxic reagents	Single-step esterification with methanol
Flash point	80 ℃	100 ℃
Hazard Statements	 H227 Combustible liquid. H302 Harmful if swallowed. H311 Toxic in contact with skin. H315 Causes skin irritation. H317 May cause an allergic skin reaction. H318 Causes serious eye damage. H373 May cause damage to organs (Liver, Stomach) through prolonged or repeated exposure if swallowed. H401 Toxic to aquatic life. H411 Toxic to aquatic life with long lasting effects.	 H315 Causes skin irritation. H317 May cause an allergic skin reaction. H401 Toxic to aquatic life.
LD_{50}	Oral-Rat-male and female >300 - <500 mg/kg	Oral-Rat-female >2,000 mg/kg
Biodegradability	aerobic - Exposure time 28 d Result: 22 % - Not rapidly biodegradable	aerobic - Exposure time 21 d Result: 95 % - Readily biodegradable
Industrial Production Cost	Higher (due to safety, regulation, raw materials)	Lower (simple route, renewable feedstock)

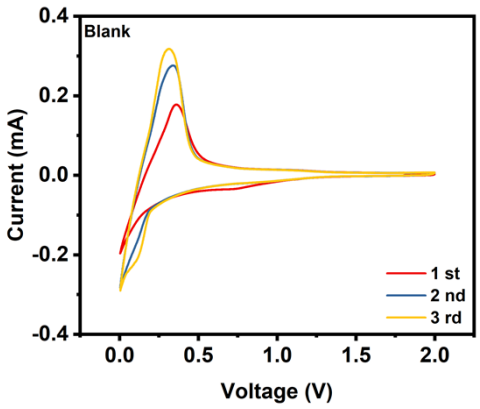

Figure S2 CV curves of the graphite/Li cells with the Blank electrolyte at a scan rate of 0.1 mV/s.

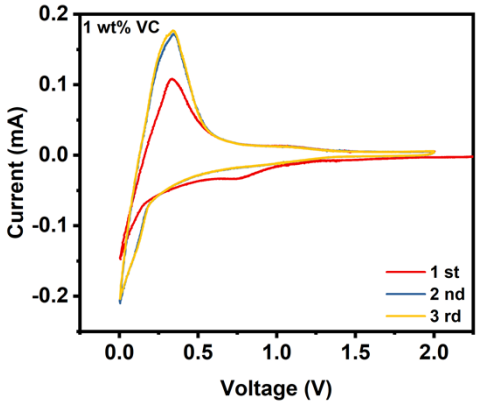

Figure S3 CV curves of the graphite/Li cells with the 1wt% VC adding electrolyte at a scan rate of 0.1 mV/s.

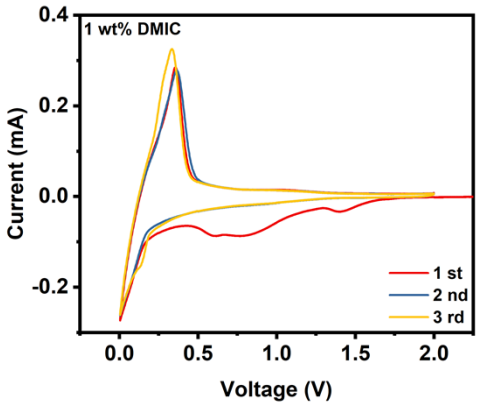

Figure S4 CV curves of the graphite/Li cells with the 1wt% DMIC adding electrolyte at a scan rate of 0.1 mV/s.

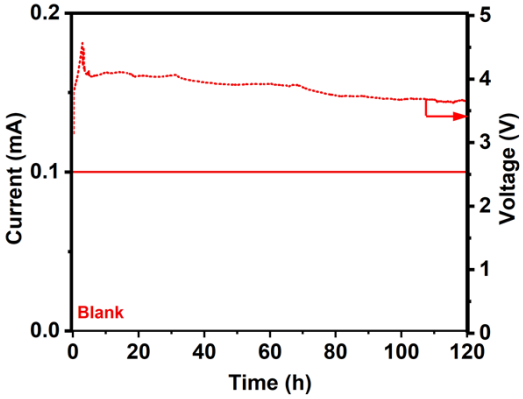

Figure S5 Leakage current of the NCM622/Li cells of Blank electrolyte.

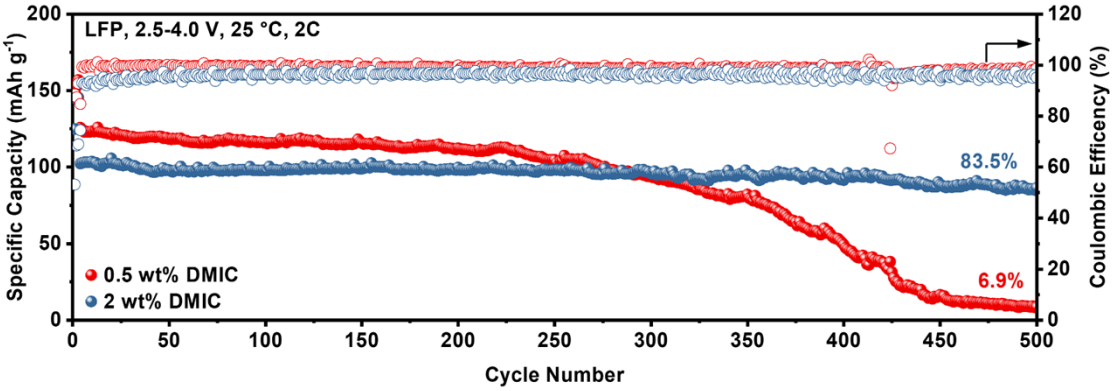

Figure S6 Long-term cycling performance at 2C of LFP/Li cells.

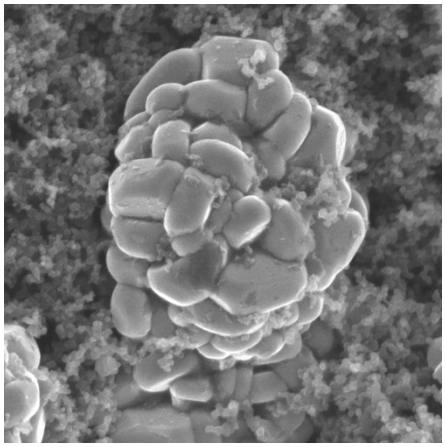

Figure S7 SEM image of NCM622 particles in the original state.