

# The effect of excess electrolyte on LIB cell life

Henrik Eriksson<sup>a,b</sup>, Anti Liivat<sup>a</sup> and Josh Thomas<sup>a,b\*</sup>

<sup>a</sup> Ångström Advanced Battery Centre (ÅABC), Department of Chemistry - Ångström Laboratory, Uppsala University, Box 538, SE-751 21 Uppsala, Sweden.

<sup>b</sup> LiFeSiZE AB, Lefflersgatan 3A, SE-754 50 Uppsala, Sweden.

\* [jot@LiFeSiZE.se](mailto:jot@LiFeSiZE.se)

Careful control of LIB cell-design parameters – typically: electrode thickness, cell balance, *etc.* - is essential to achieving reproducible cell performance [1]. In this context, *the amount of electrolyte used* is one of the less commonly examined parameters but is, nevertheless, a key factor limiting cell life [2]. We therefore focus here on this particular feature alone in our cell fabrication procedure, where electrolyte excesses of 0%, 20% and 40% of the porous cell volume are studied in < LiFePO<sub>4</sub>/C | Cellgard separator | G > stacked pouch-cells. If electrolyte is consumed through degradation reactions, the cells will ultimately fail through collapse of ionic pathways and consequent increase in internal resistance. This collapse can be postponed through the use of excess electrolyte, though other problems such as deficient cell assembly, excessive degassing - and the consequences of waste electrolyte - must also be considered.

A typical AM:carbon:binder ratio of 90:5:5 is used in the cathode slurry formulation which – after coating, drying and calendaring using our state-of-the-art pilot-line (\*) – is balanced against in-house fabricated graphite (G) negative electrodes. A conventional EC:EMC (3:7) solvent is used with a 2wt% VC additive and a LiTDI salt [3,4]; this salt is known to resist thermal decomposition more effectively than the conventional LiPF<sub>6</sub> salt, and has even been shown to enhance cell life at elevated temperatures when used as a salt additive [5,6]. By cycling the cells at a moderately elevated temperature (40°C) and using this LiTDI salt, our hope is that we can channel the electrolyte degradation process more towards solvent loss than salt decomposition. Our overall goal is thus to establish the effect of using excess electrolyte on the performance of a series of *ca.* 1Ah < LFP | LiTDI+VC EC:EMC | G > full-cells cycled galvanostatically for several months.

(\*) *Financed by The Battery Foundation of the Swedish Energy Agency (STEM).*

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