



**LC-BAT-14: HINDERING DENDRITE GROWTH IN LITHIUM METAL BATTERIES**

**Grant Agreement n° 957202**

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**D3.3: Optimized and tested cathode and anode material in quantities suitable for upscaling**

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## Publishable Summary

The HIDDEN approach aims at hindering dendrite growth in lithium metal cells with thermotropic ionic liquid crystal (TILC) and/or piezoelectric separator (PES). For an isolated evaluation of the self-healing properties of TILC and PES, the same NMC cathode and lithium anode materials shall be used for all variants, including a baseline reference system built with liquid electrolyte. However, this implies that the electrode materials can be used to build cells with liquid electrolyte and TILC electrolyte.

In this regard we have demonstrated that the expected performance in terms of cell discharge capacity can be reached for liquid electrolyte systems, as shown in Figure 1. As to be expected for lithium metal cells, the number of charge-discharge cycles before reaching less than 80% of initial energy storage capability is strongly dependent on the electrolyte used.

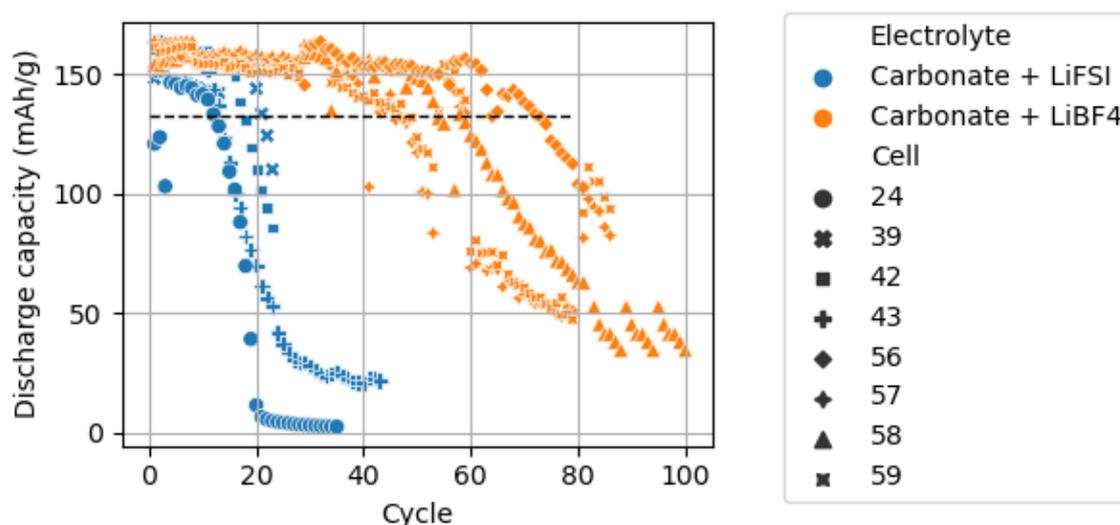


Figure 1: Discharge capacity of lithium metal cells with NMC cathode for different liquid electrolyte types. Cell 24: C-rate charge & discharge = 0.05, Cells 57, 59: C-rate charge = 0.1, C-rate discharge = 0.1, other cells: C-rate charge & discharge = 0.1

At room temperature the model system TILC electrolyte used (i.e., 1(3).LiFSI in a 9:1 molar ration) is solid, thus a cell with TILC electrolyte is a solid-state battery. To make any battery functional the electrode particles must to be in physical contact with the electrolyte particles, which is obviously more difficult to guarantee for solid-state batteries. In HIDDEN we have achieved this with an appropriate processing method, which infiltrates our standard NMC cathode with the TILC electrolyte.