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

Grant Agreement n° 957202

D[3.2]: Piezoelectric separator layer and its poling process

Lead Author: Leonardo Pires da Veiga, (CSEM)

with contributions from:

Reviewers: Samuel Malburet (SP)

Mari Ylikunnary (VTT)

Claudio Brivio (CSEM)

Deliverable nature	Report
Dissemination level	Confidential
Contractual delivery date	30.04.2022
Actual delivery	29.04.2022
version	4

Publishable Summary

In the framework of the HIDDEN project, one of the self-healing strategies that are investigated is the use of an electroactive polymer as a separator to mitigate surface instabilities of Li-metal. The first challenge is the choice of the material, a first candite is PVDF, which has been demonstrated to show a piezoelectric behavior under specific conditions: by applying a strong electric field, a process called 'poling', PVDF changes its crystalline organization and becomes polar, giving it a piezoelectric response. We decided to use a modified version of PVDF, called PVDF-TrFE, that solidifies spontaneously in a polar phase; however, this is not enough to yield piezoelectric proprieties and a poling step might still be necessary. The second challenge is the production of a porous membrane, we used a non-solvent phase inversion method, that consists in mixing PVDF-TrFE with a solvent in this case DMSO, to yield a viscous slurry. The slurry is cast on a glass substrate, which is then immersed in a coagulation bath, where the PVDF-TrFE will solidify in a highly porous manner, making it suitable to be used as a separator. Material level characterizations, such as FTIR and NMR, demonstrate that indeed the polymer is polar, and now the performance of the separator is being tested in full battery configurations with and without an additional poling step. In the next steps, HIDDEN will replicate the same casting process in a pilot line to investigate how it can be upscaled.