Applications Poster Abstract

Test rig for a dynamic cell temperature control based on cycle parameters

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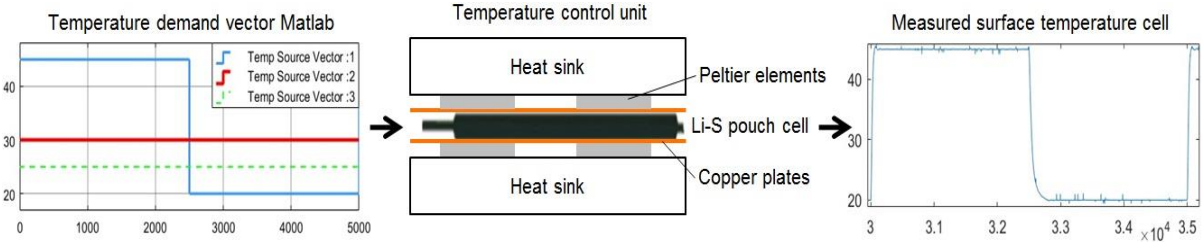
Due to their high energy density lithium-sulfur (Li-S) batteries are a potential replacement for today's widely spread Li-ion technology. However, for a noticeable uptake for practical applications issues like the self-discharge, degradation and low rate capability[1] have to be solved. While the main focus for solving these lays on the used materials and inner cell reactions, we propose to enhance cell performance for already available cells by changing their operational temperature according to cycling parameters like the SoC.

The shuttle effect for example, responsible for degradation and self-discharge[2], could be reduced simply by lowering the cell temperature to decrease the transport properties of the electrolyte in the high plateau. Furthermore an increased temperature within the low plateau could enhance the rate capability and utilisation as cycling tests indicated[3].

Since most BMS systems are designed to operate the cells at a constant temperature and standard laboratory equipment, like thermal chambers, is to slow to change the cell temperature reasonable quick, a specific test rig is designed. Therefore we propose a low cost solution to control the surface temperature of an OXIS 3.4 Ah long life pouch cell. To enhance the flexibility and simplicity for the user the temperature can be set by a Matlab script according parameters like time, SoC or battery voltage. Fig. 1 presents the basic rig structure together with a time based temperature profile.



The finished poster will incorporate details of the test rig approach as well as an initial cell discharge test result for a current pulse discharge in combination with a mixed temperature profile.

References

1. Mikhaylik, Yuriy V., et al. "High energy rechargeable Li-S cells for EV application: status, remaining problems and solutions." *Ecs Transactions* 25.35 (2010): 23-34.4
2. Mikhaylik, Yuriy V., and James R. Akridge. "Polysulfide shuttle study in the Li/S battery system." *Journal of the Electrochemical Society* 151.11 (2004): A1969-A1976.2
3. Propp, Karsten, et al. "Multi-temperature state-dependent equivalent circuit discharge model for lithium-sulfur batteries." *Journal of Power Sources* 328 (2016): 289-299.