Voltage hysteresis as a function of state of health in Litium ion battery cathodes

Julija Hodakovska[1, *], Liga Britala[1,2], Ansis Mezulis[1], Liga Grinberga[1], Gunars Bajars[1], Gints Kucinskis[1]

[1] *Institute of Solid State Physics, University of Latvia, 8 Kengaraga Street, Riga, LV-1063, Latvia*
[2] *Faculty of Natural Sciences and Technology, Riga Technical University, 3 Paula Valdena Street, Riga LV-1048, Latvia*
**Julija.Hodakovska@cfi.lu.lv*

Timely replacement of an aged Li-ion battery improves the quality of life of users; for some implementations it may be a crucial issue. Furthermore, there is great interest in the 2nd life application of used batteries. However, no commonly accepted, universal state of health (SoH) evaluation model for both practical implementations and scientific description currently exists due to the complex nature of the ageing processes inside batteries.

In our work we focus on two common cathode materials and evaluation of their SoH: commercially available lithium iron phosphate ($LiFePO_4$, LFP) and lithium nickel manganese cobalt oxide ($LiNi_{0,8}Co_{0,1}Mn_{0,1}O_2$, NCM811). Samples were tested in a half-cell coin cell setup according to a defined procedure and the aquired data was used to calculate the voltage hysteresis (Figure 1). Then different possible correlations between SoH and the voltage hysteresis were examined. The results of this work show that the SoH of a cathode has a strong correlation with voltage hysteresis observed in half-cells.

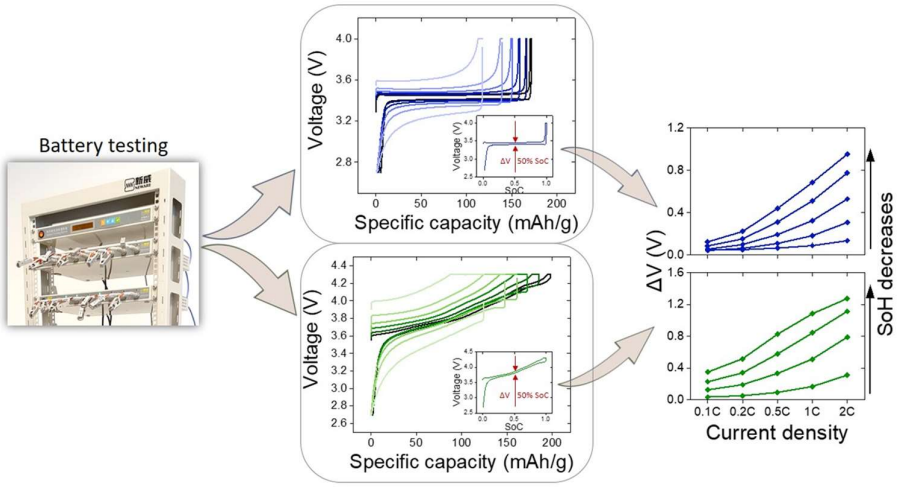

Figure 1: Schematic representation of experimental part

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