



Aalborg Universitet

AALBORG UNIVERSITY
DENMARK

Unravelling the aging process of commercial $\text{Li}(\text{Ni}_{0.5}\text{Co}_{0.2}\text{Mn}_{0.3})\text{O}_2/\text{graphite}$ lithium-ion batteries

Guo, Jia; Li, Yaqi; Pedersen, Kjeld; Stroe, Daniel-Ioan

Published in:
74th Annual Meeting of the International Society of Electrochemistry

Creative Commons License
Other

Publication date:
2023

Document Version
Accepted author manuscript, peer reviewed version

[Link to publication from Aalborg University](#)

Citation for published version (APA):

Guo, J., Li, Y., Pedersen, K., & Stroe, D.-I. (2023). Unravelling the aging process of commercial $\text{Li}(\text{Ni}_{0.5}\text{Co}_{0.2}\text{Mn}_{0.3})\text{O}_2/\text{graphite}$ lithium-ion batteries. In *74th Annual Meeting of the International Society of Electrochemistry: Bridging Scientific Disciplines to Adress the World's Challenges ISE 2023*.

General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal -

Take down policy

If you believe that this document breaches copyright please contact us at vbn@aub.aau.dk providing details, and we will remove access to the work immediately and investigate your claim.

Unravelling the aging process of commercial $\text{Li}(\text{Ni}_{0.5}\text{Co}_{0.2}\text{Mn}_{0.3})\text{O}_2/\text{graphite}$ lithium-ion batteries under constant current cycling

Jia Guo^a, Yaqi Li^b, Kjeld Pedersen^b, Daniel-Ioan Stroe^a

^a AAU Energy, Aalborg University, Aalborg 9220, Denmark.

^b Department of Materials and Production, Aalborg University, Aalborg 9220, Denmark
jgu@energy.aau.dk

Constant current charging and discharging is widely used nowadays for commercial lithium (Li) ion batteries (LIBs) in applications of portable electronic devices and electric vehicles. However, the main battery degradation mechanism during constant current cycling remains unclear.

In this work, electrochemical cycling, real-time temperature monitoring, and operando electrochemical impedance spectroscopy of a fresh and an aged battery have been carried out to unveil the aging mechanism during constant current cycling^[1]. The results of the incremental capacity analysis (ICA) indicate that polarization is the main reason for the capacity fading during operation.

As shown in Fig. 1^[1], with battery aging, the battery charging curve shows an upward trend and the battery discharging curve shown a drop trend in voltage scale. The voltage plateau also can be translated to peaks in IC curves, Fig. 1b. As battery cycling, the b peak shifts to a high voltage direction, which means the impedance increasing inside the battery. The change of b peak shows same trend with the battery SOH degradation in Fig. 1c. Therefore, the battery degradation is related to the impedance increasing inside battery. As internal impedance increasing, the battery OCV becomes more and more narrower, which leads to a low charge and discharge capacities. Therefore, the battery degradation.

The main reason of impedance increasing also be analyzed and discussed in our recent study.

Acknowledgements Jia Guo would like to give a thanks to Otto Monsted for their support.

Reference:

- [1] J. Guo, S. Jin, X. Sui, X. Huang, Y. Xu, Y. Li, D. W. Peter Kjær Kristensen, D.-I. Stroe, *Journal of Materials Chemistry A* **2023**.

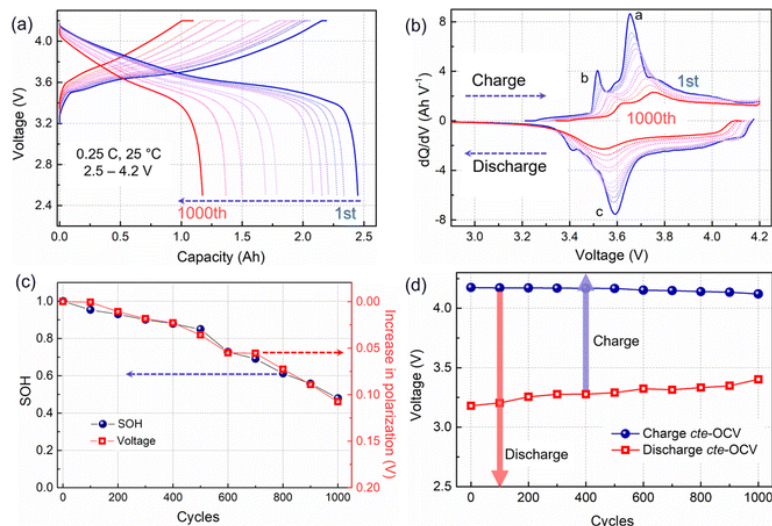


Fig. 1 aging process of an aged commercial battery in 1000 cycles. (a) cycling performance; (b) IC curve; (c) SOH and polarization change; (d) battery OCV of a commercial battery^[1].