Unravelling the aging process of commercial Li(Ni0.5Co0.2Mn0.3)O2/graphite lithium-ion batteries

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

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Unravelling the aging process of commercial $Li(Ni_{0.5}Co_{0.2}Mn_{0.3})O_2$/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 operdando 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.

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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**.

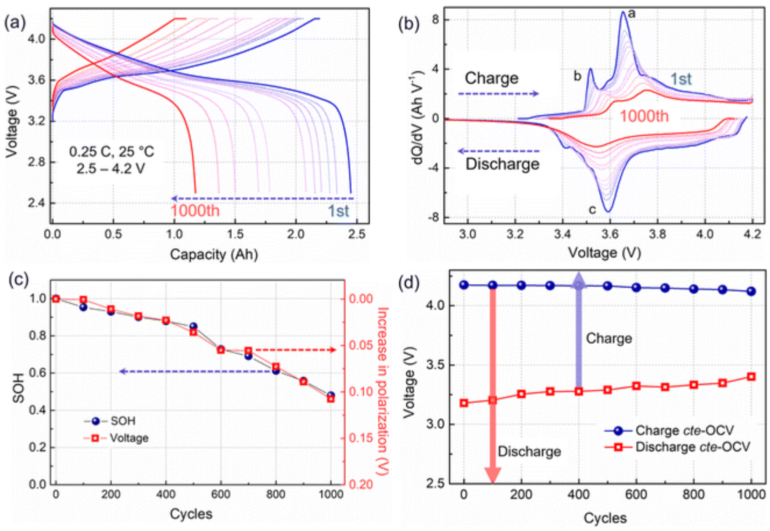

Fig. 1 aging process of an aged commercial battery in 1000 cycles. (a) cycling performance; (b) IC curve; (c) SOH and polarization change; (d) battery OCV of a commercial battery[1].