A phenomenological approach to SOH prediction of Graphite/NMC cells

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A reliable prediction of *State of Health (SOH)* is a paramount instrument for successful business modelling, engineering and management of Li-ion *Battery Energy Storage System (BESS).*

The presented experimental work illustrates a phenomenological approach to SOH evaluation and prediction; among the several factors influencing SOH (temperature, voltage and C-rate, to mention few), it focuses on *Depth of Discharge (DoD)*, which is the main viable option to increase system lifetime and, therefore, represents a key design parameter in G/NMC technology.

The developed method consists of cycling a series of samples at various partial DoD and performing reference full-DoD cycles and *Internal Resistance (IR)* routines at regular intervals. Data analysis allows obtaining a prediction curve of lifetime as a function of DoD; deviation from exponential trend at very low DoD's, if any, reveals a different ageing mechanism in that range. Evolution of IR is linear at all DoD's; if that represents a valuable instrument for thermal management and BMS design, it also suggests that capacity fading is not the effect of pure IR increase.

Future work will focus on dissociating DoD and voltage contribution to both capacity fading and impedance increase, as well as investigating temperature and C-rate influence.

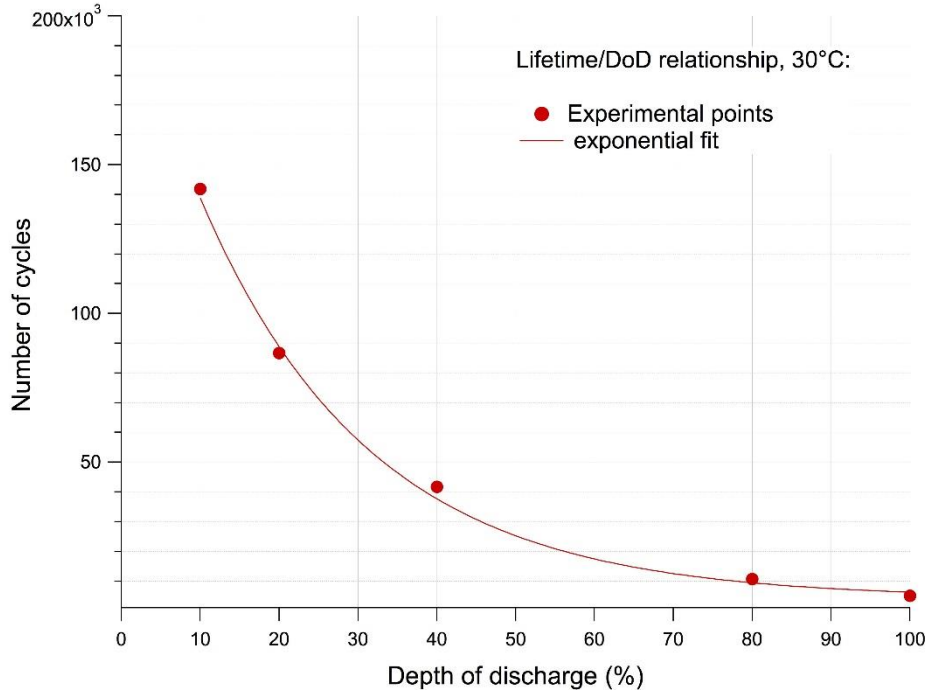

Figure 1: SOH predictive exponential curve.