

Abstract:

Pressure as Lifetime Extender for Lithium-Ion Batteries – Potentials and Challenges

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Fulfilling the service life of a Lithium-Ion battery in each intended application requires further understanding of the cells' lifetime and reliability. Derived from literature, controlling the external pressure constant on Lithium-Ion battery cells is an inevitable factor to extend the cycle lifetime. Thus, active knowledge of the cells' strain and understanding the impact of an external pressure on the impedance is mandatory to evaluate an optimum pressure to improve the cell performance. This work presents correlations between voltage, strain and impedance as a function of the applied constant external pressure on a nickel-rich NMC lithium-ion pouch cell. Utilizing a high precision universal testing machine reveals a negligible change of the cells' maximum stroke within the pressure range from 0 kPa to 1000 kPa. Additionally, an optimum pressure between 100 kPa and 300 kPa is revealed. Within this pressure range the charge transfer resistance as well as the diffusive processes exhibit its optimum.