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| Title: | Influence of External Mechanical Compression on the Impedance of Li-ion Cells |
| Authors: | Bernhard Liebhart, Lidiya Komsiyska, Martin Satzke, Christian Endisch |
| Affiliation: | Institute of Innovative Mobility, Technische Hochschule Ingolstadt, Germany |

Generally, during charging and discharging the active materials of Li-Ion cells undergo contraction and expansion (breathing). In addition, irreversible aging processes such as SEI growth and electrolyte decomposition are causing continuous expansion of the cell, called swelling. In real applications, however, pouch and prismatic li-ion cells are usually set up in a module where all cells are serially compressed. Thereby the expansion is limited by the module housing, impeding the volume changes and inducing strain within the cells [1]. Despite the strong influence of the compression in a module on the cell behaviour and performance, in the literature, there are comparatively few publications to date that deal with this topic.

To better understand the impact of the external compression on the cell behaviour single Li-ion cells were subjected to various external compressions ranging from 0.5 to 5 MPa. Thereby, at each pressure level linear and non-linear electrochemical impedance spectroscopy was performed in the frequency range of 50 kHz to 100 mHz. For the presented study single 120 mAh pouch cells, with a high energy NMC (622)/Graphite design, were used. The results show that the applied mechanical stress has very low impact on the non-linear impedance response [2]. In contrary, the applied pressure affects significantly the linear impedance measurements over the entire frequency range. To quantify the influence of the applied pressure, the linear impedance spectra were evaluated using an equivalent circuit model. The evaluation reveals that all resistances (ohmic, charge transfer and diffusion) rise as a function of the applied pressure; however, the manner and the magnitude of the increase differ.

References:

[1] Popp et.al. *J. Energy Storage* **2020**, 32, 101859.

[2] Liebhart et.al. *J. Power Sources* **2020**, 31, 228673.