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Investigating Li-ion batteries negative electrode swelling processes using electrochemical dilatometer

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Li-ion batteries despite being the most commercialised electrochemical energy storage system are still suffering some drawbacks during their cycling. Indeed, several processes are taking place during cycling, i) the electrodes are "breathing" during oxidation and reduction, ii) the electrolyte is reduced and oxidised generating several surface reactions among them the well-known solid electrolyte interphase (SEI). As an example, at the negative electrode, graphite is suffering a volume expansion of up to 10% that is generally reversible but upon long-term cycling can be a caused of fading. This induced mechanical stress and its consequence on the electrochemical performance need to be investigated. Nano electrochemical dilatometer can help up addressing the question about the swelling of the electrode as well as the swelling caused by the SEI and other surface reactions (ref 1,2). We propose here to investigate the swelling of graphite SFG6 by nano electrochemical dilatometer. A scheme of the device is depicted in Figure 1. The T-frit which is a borosilicate separator, ensures that the dilatometer is only monitoring one electrode at a time. The sensor placed on the top of the cell is thus only measuring the working electrode (WE) displacement during cycling using a three-electrode assembly. Additionally, a thermocouple is linked to the apparatus helping to highlight the influence of the temperature on the sensor displacement.

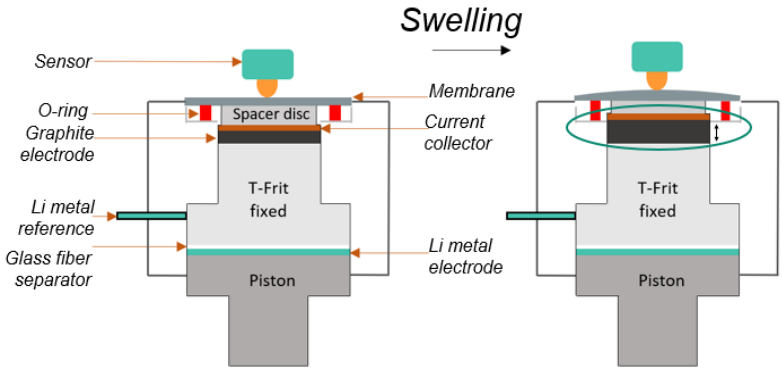

Figure 1 : *Cross section scheme of the nano-dilatometer (ECD-3-Nano, EL-Cell GmbH) device.*

In this presentation we will show the influence of the graphite stages onto the dilatometer measurement, investigating the first lithiation/delithiation of SFG6 graphite electrode.

References

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