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A precisely piezo-controlled macro-ATR for characterizing the dynamic behaviour electrolyte/electrode interface

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In all battery systems, electrolyte plays a vital role in determining the stability of the electrodes, as well as the safety of the battery uses. The good solid electrolyte interphase (SEI) protective layer formed at the first cycling process of the battery, rather than continually accumulating on the electrode surface, and is not dissoluble in electrolytes, making its properties highly dependent on the chemical structure. Therefore, further development of safe battery technology strongly requires a better understanding of the chemistry and formation mechanism of the SEI, which remains largely unknown due to their complex structure and a lack of reliable in situ experimental techniques. Based on the above, a novel piezo-controlled macro-ATR (within a precise controlling thickness of 100 nm above the electrode surface) is successfully developed for battery research in the IRM beamline in the Australian Synchrotron. This innovation enables probing the real-time reaction inside a battery at the micro-scale with an accurate controlled detecting movement to the electrode surface. Changes in functional groups and their distribution observed will be complementary with the ex-situ results to provide a better understanding of the mechanisms occurring in different electrolytes at different stages, which will subsequently be correlated to their stability and charging performance. Such knowledge will be critical for optimizing the ingredients of non-flammable electrolytes to support further development of more stable and high-performance batteries and enable scientific design principles of non-flammable electrolytes.

Level of Expertise

Student

Presenter Gender

Woman

Pronouns

She/Her

Which facility did you use for your research

Australian Synchrotron

Students Only - Are you interested in AINSE student funding

Yes

Do you wish to take part in the Student Poster Slam

Yes

Condition of submission

Yes

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