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Type: **Talk (20 min + 5 min discussion)**

Neutrons and X-ray methods for investigation of Li-ion batteries at material, electrode and cell level

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Neutrons are powerful and have unique characteristics, which make possible non-destructive and operando characterizations of cylindrical and prismatic Li-ion batteries. X-rays are an equally competent tool that can provide complementary information on pouch type Li-ion cells during cell operation. Expectedly, both are also capable of providing information at material and electrode level. This contribution will show with several examples how neutrons and x-rays methods such as diffraction, small and wide-angle scattering and neutron depth profiling were helpful in estimating electrochemically active Li losses, Li plating and Li diffusion kinetics at cell level, Li distribution profiles and pore morphologies at electrode level, interplay between mechanics and their molecular origins at material level. These insights are useful to understand the improvement in cell performance by (a) altering the graphite electrode morphology, (b) by preparing composite silicon-graphite electrodes, (c) by Si deposition on TiO₂ nanotubes, (d) and by applying polymer coatings to Li metal anode surfaces.

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