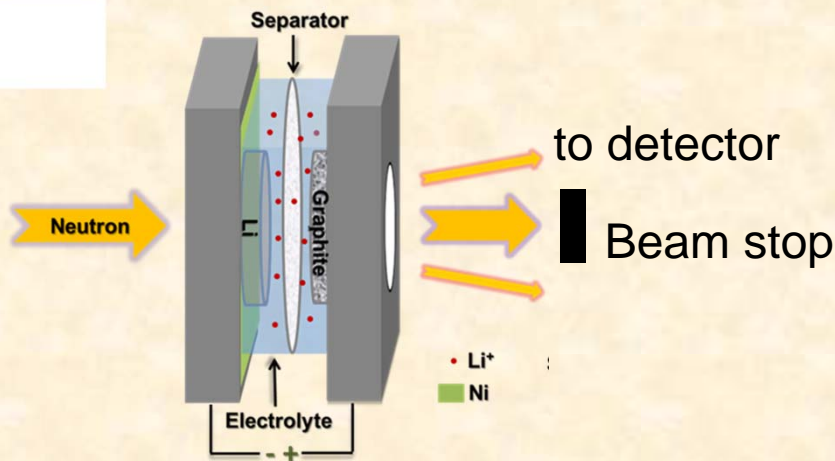


# Neutron Scattering Study of Cathode Materials for Li-Ion Batteries

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- Small angle neutron scattering (SANS) is particularly sensitive to the scattering length density of electrode materials due to lithiation and delithiation and the variation of surface areas.
- A specially designed battery cell containing graphite vs. Li was fabricated to enable both the battery operation and *in situ* SANS measurements.
- In situ* SANS measurements were carried out to reveal structure variations of active materials in real time.

- The battery half cell was cycled at various rates of charge/discharge during SANS measurements and the electrochemical performance was recorded.
- The current, potential, and electric charge displacement profiles indicate the typical performance of a graphite electrode.
- The variation of integrated SANS intensity upon cyclic charge/discharge rises and falls in apparently full synchronization with charge states. This is due to the contrast variation induced by lithiation/delithiation.
- The amplitude of the SANS intensity variation becomes even larger as the charge transfer becomes shallower at higher cycling rates. The excess scattering could result from new surfaces created due to fracturing of graphite particles.

