Kerr gated Raman spectroscopy as a diagnostic for high states of electrochemical lithium intercalation into graphite electrodes for Li-ion cells

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The general applicability of Kerr gated Raman spectroscopy as a strong diagnostic tool for tracking high states of charge in graphitic electrodes has been expanded through combinations of ex situ and operando spectroelectrochemical experiments.

The approximate sensitivity of the graphitic G-band towards lithiation at high states from $Li_{0.5}C_6$ to LiC_6 was found to be a general observation; consistent across different graphite materials and electrolyte formulations (Figure 1), and experimental conditions, and was retained in subsequent cycles (Figure 2).

While this information is often lost underneath emission baselines in conventional Raman investigations of electrochemical intercalation into graphite, these findings further strengthen the potential of Kerr gated Raman spectroscopy as a powerful tool to track the high states of charge in graphite-based electrodes in Li-ion cells.

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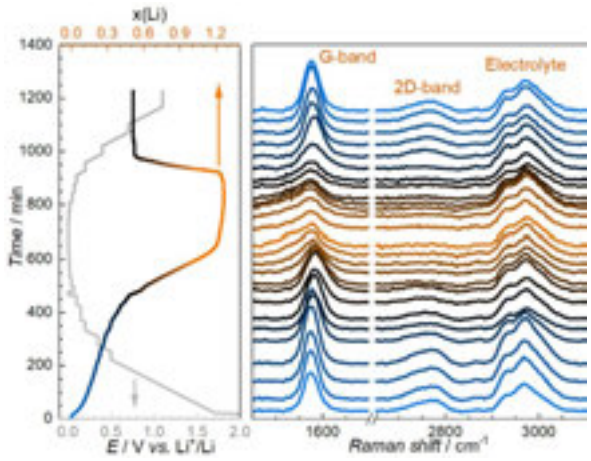

Figure 1: (a) Potential sweep/hold potential and changes in cell capacity (x in Li_xC_6) of the graphite electrode and (b) the operando Kerr gated Raman spectra showing the primary G and 2D graphite bands at 1580 and 2780 cm^{-1}, respectively (electrolyte bands at ca. 2980 cm^{-1}).

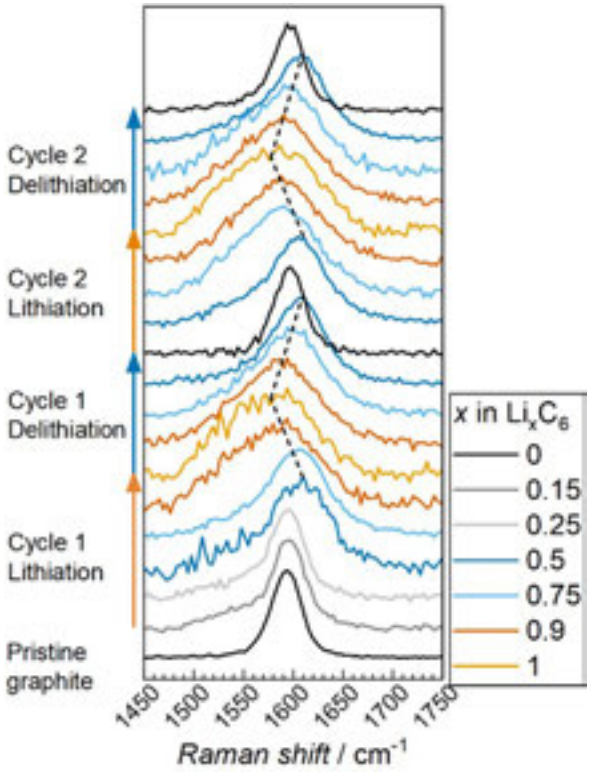

Figure 2: Ex situ Kerr gated Raman spectra (normalised) of SFG-6 graphite electrodes cycled to various states of intercalation (x in Li_xC_6). The dashed lines show an approximation of the band shift for each cycle.