X-Ray Photoelectron Spectroscopy Peak Deconvolution for Lithium-Ion Batteries

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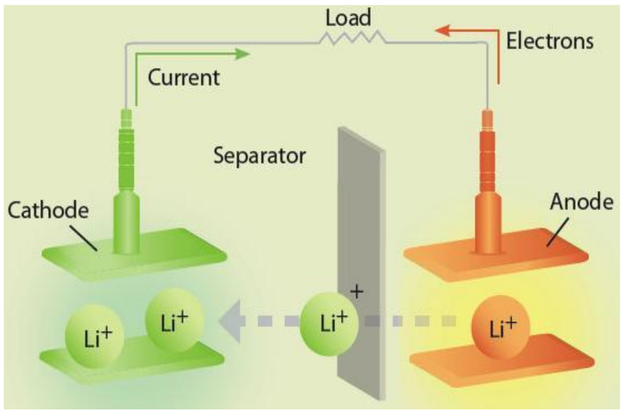
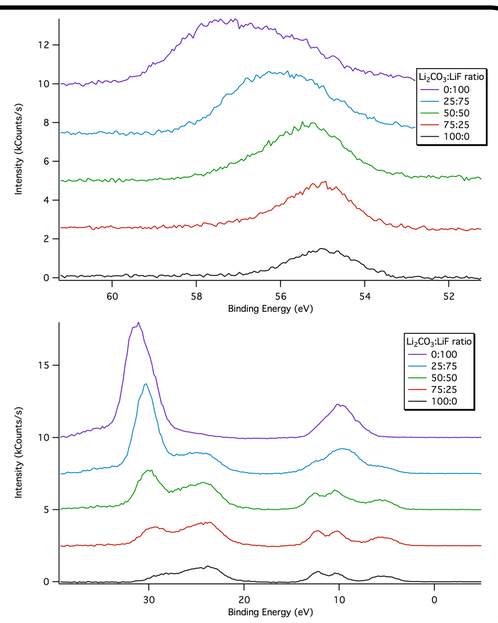
Lithium ion battery info



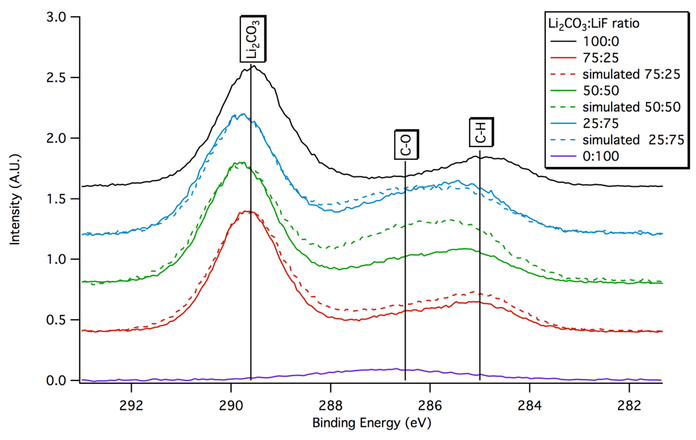
- Lithium ions ferry charge between cathode and anode – Electron flow in external circuit maintains charge neutrality
- A secondary battery is one that can be recharged
- Li-Ion batteries lose capacity over time
  - Solid Electrolyte Interphase (SEI) contributes to and can minimize this
- Chemical reactions at anode dictate SEI composition

Lithium Spectra

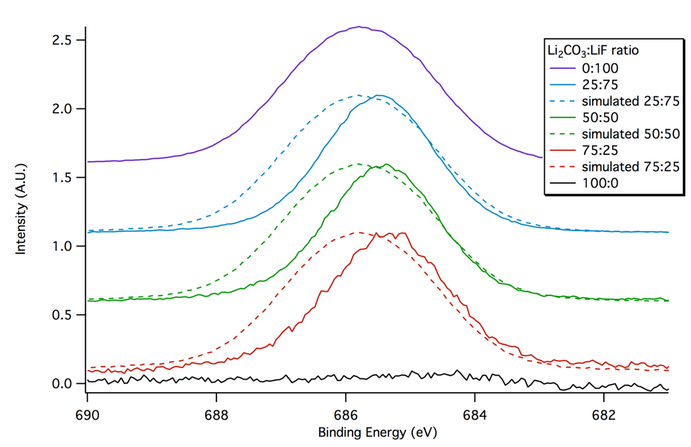
Valence Spectra



Carbon Spectra

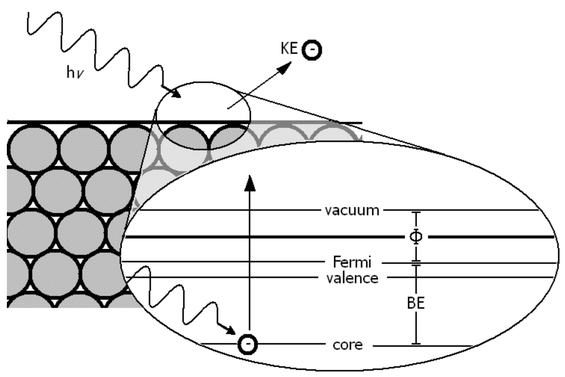


Fluorine Spectra



XPS info

- Measures elemental composition of a sample, especially useful at surfaces
- Yields plots of counted photoelectrons vs. electron binding energy
- Gives composition in the parts-per-thousand range
- Peak deconvolution methods need improvement for analysis of real SEI



$$KE = h\nu - (BE + \Phi)$$

Conclusions

- Pure LiF sample shows multiple Li1s peaks
  - Li_2O probable
- Photon stimulated reactions observed
  - Additional care required for publication
- Proof of concept is obtained for spectral deconvolution via standards
- Valence spectra less affected by photon reactions
  - Additional focus on these going forward

References:

- White Paper: Rechargeable Batteries http://www.maximumpc.com/article/features/white_paper_rechargeable_batteries

This work was supported by US Department of Energy EPSCOR Implementation Grant DE-SC0007074 and by the administration of Rhode Island College.