In-situ TEM Characterization of Electrochemical Processes in Li-ion Batteries

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The accelerated design and development of the next generation electrodes and electrolytes for electrical energy storage devices necessitates the development of unique *in-situ* experimental methodologies that are aimed at providing a mechanistic insight into the nanometer-scaled, microstructural and chemical changes that occur during the electrochemical energy conversion process. *In-situ* electron microscopy provides a viable means to investigate structure-property relationships of energy storage materials under electrochemical exposure such that the dynamically evolving processes can be studied in *real-time* and at high temporal and spatial resolution. A newly developed *in-situ* electrochemical cell transmission electron microscope (TEM) holder (*from Hummingbird Scientific*), which enables the direct imaging of electrodes, interfaces, and surfaces under electrochemical exposure through a liquid electrolyte and within a TEM was utilized to study the influence of electrolyte/electrolyte additives on the formation and stability of the SEI on graphite in different organic and ionic liquid electrolytes.

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