

# Materials Chemistry Seminar

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## **‘Nanostructured Silicon Alloy Anodes for Lithium-ion Batteries’**

**Thursday  
Nov. 19, '09  
12:15 p.m.  
Room 1315  
Chemistry**

Conventional lithium-ion construction uses a  $\text{LiCoO}_2$  cathode and an anode comprising graphite. It has long been known that elements that form alloys with lithium (Al, Si, Sn, etc.) can accommodate far more lithium per unit volume and mass than graphite. For instance, silicon can accommodate 10X more lithium per unit mass and 3X more lithium per unit volume than graphite. The replacement of graphite anodes with alloy-based materials such as silicon can significantly increase the energy storage capabilities of lithium-ion cells. However the uptake of lithium in such alloys is accompanied by a massive volume expansion (nearly 4X in the case of silicon), which has impeded their implementation in commercial cells.

3M has addressed the issues associated with alloy anode materials with new nanostructured alloys, electrode formulations and polymeric binder materials that it is commercializing. In this talk aspects of electrochemical alloying reactions with lithium and details of 3M's commercial silicon-based anode material technology will be discussed.