My Li-Ion batteries (LIB) are the fastest growing segment of the secondary battery market. This growth is largely driven by a rapidly increasing demand for electric vehicles (EV), almost universally powered by LIB. However, the driving range of EV still falls short of fossil fuel powered vehicles, limiting market adoption. This disadvantage could be overcome by increasing LIB energy density, which in turn is limited by anode capacity. Currently, premium cells utilize a small fraction (~1% w/w) of a high capacity material, Si (4200 mAh/g theoretical), to give a modest increase to the capacity of its primary active material, graphite (372 mAh/g theoretical). Using a larger fraction of Si results in a much larger increase in capacity, however, this leads to rapid mechanical degradation of the anode due to the drastic expansion (~320%) that Si experiences upon lithiation.

We are exploring the synthesis of Si nanocrystals and carbonaceous composites as a way to alleviate the detrimental effects of expansion. By using a porous host material, small particles may have room to expand without causing electrode disruption. This in turn may allow stable charge/discharge cycling of anodes with a much larger fraction of Si, and consequently much higher capacity, than those in today’s state of the art commercial cells. Here we present a one-pot, relatively ecologically benign, inexpensive and high yielding synthesis of intimately mixed composites of Si nanocrystals in carbon host materials and their electrochemical performance.

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Friday, September 1, 2017
SEH B1220
2:00 - 3:00 p.m.
Refreshments will be served at 1:45 p.m.