

Properties and opportunities of nanoscale materials design

Abstract for inaugural lecture

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Upon reducing the size of a crystal towards the nanoscale, the quantum mechanical effects of coherence and quantization begin to dictate its properties. In addition to fundamental interest, this can be used as a resource and guide for designing materials and devices with new properties. Just a few years ago this was a theoretical dream, however, the incredible drive within the semiconductor industry towards ever smaller electronic devices have led to the development of amazing tools that allow us to manipulate surfaces at the nanoscale. Using these tools in conjunction with crystal growth now enable the realization macroscopic crystals with structures designed at the nanoscale.

In this lecture, I will discuss this approach and how it can be used to gain new insight into the properties of matter, design materials capable of efficient conversion of energy e.g., heat to electricity and with tailored interactions with the environment.