Institute for Molecular & Nanoscale Innovation
Division of Engineering

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Nanostructuring for Energy Conversion: Transparent and Catalytic Carbon Nanotube Films

In order to stabilize carbon dioxide concentrations in the atmosphere below a target level of ~500 parts per million, our energy supply infrastructure will need to a reach near-zero carbon emissions target. Many energy technology options that promise the lowest carbon emissions intensities, such as photovoltaic cells, fuel cells and batteries, require materials properties that can be achieved through nanostructuring. In this talk I will provide an example of the benefits of nanostructuring, by reporting on the synthesis of thin, transparent and highly catalytic carbon nanotube films. I will show that nanotubes catalyze the reduction of triiodide, a reaction that is important for the dye-sensitized solar cell, with a charge transfer resistance that decreases with increasing film thickness. Moreover, the catalytic activity can be significantly enhanced by exposing the nanotubes to ozone in order to introduce defects, allowing for optimization of trade-offs between catalytic activity, conductivity, and transparency. The presentation will conclude with a discussion of the broad importance of nanostructuring for reaching an ultra-low carbon energy conversion target.

Bio: Jessika Trancik is a postdoctoral fellow at the Santa Fe Institute and an adjunct associate research scholar at the Earth Institute, Columbia University. She studies technical barriers to reaching an ultra-low carbon and low-cost energy technology target, and explores nanoengineering solutions. Jessika's background is as follows: B.S. Cornell University (materials science and engineering); Ph.D., University of Oxford (solid state physics), Rhodes Scholarship; Earth Institute Fellowship, Columbia University (energy systems, energy economics and materials science). She has also worked for the United Nations, as an advisor to developing countries on energy and development, and as an advisor to venture capital firms and investment banks on energy technology portfolios.

Barus & Holley Room 190
1:00 – 2:00 pm