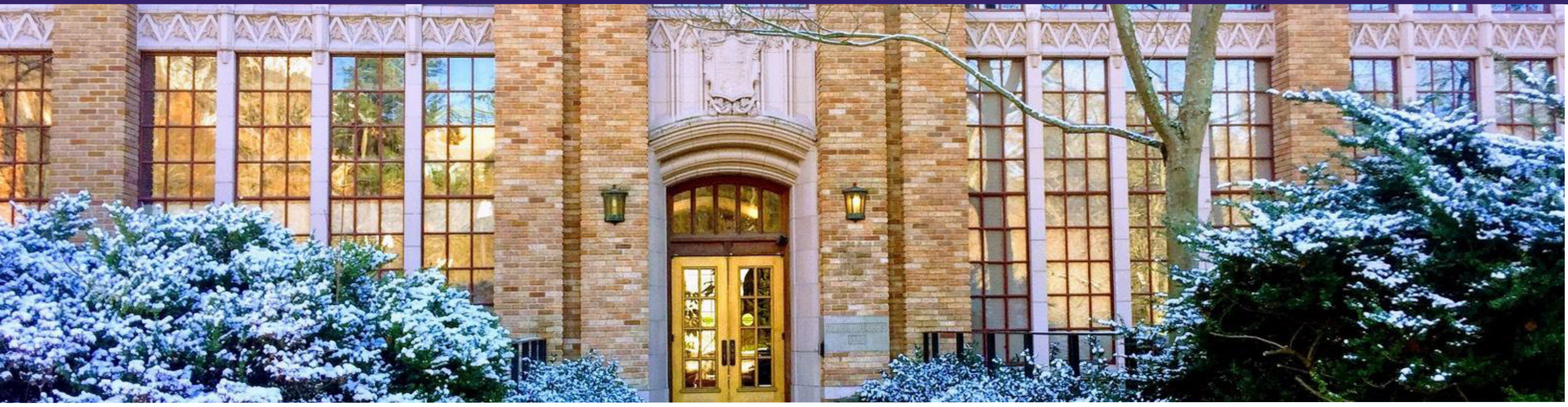
MSE 520: SEMINAR SERIES

MATERIALS SCIENCE & ENGINEERING | WINTER 2018

MARCH 05, 2018 | 153 MUELLER HALL | 3:30 PM



Tailoring Radiation with Nanostructures for Personal Thermal Management

As population and living standards increase, the energy demand and climate change have reached unprecedented levels that require more efficient technologies to be developed. Personal thermal management, providing heating and cooling only to the human body, offers a promising strategy to mitigate the enormous energy consumption for indoor temperature control as well as to better meet the basic human needs in combating the effects of climate change. To achieve localized heating and cooling, the thermal radiation emitted by human body is an essential aspect to consider. In this talk, I will present my current research efforts on material design and structural engineering of textiles to achieve passive regulation of radiation heat transfer between the human body and the environment. The significance of combining radiation control concepts with nanophotonic structures is demonstrated with two important personal thermal management applications, i.e., 1) outdoor cooling for tackling the increasingly intense and frequent heat stress from global warming, and 2) indoor heating for saving the largest energy end use in buildings. Finally, I will also introduce my previous research on developing flame-based manufacturing methods for metal oxide nanomaterials. This work can scale up the production of technologically important oxide nanomaterials to advance many applications, including solar water splitting, catalysis and electronics.

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Dr. Lili Cai is currently a postdoctoral fellow in the Department of Materials Science and Engineering at Stanford University, working on novel composite materials with advanced thermal radiation properties for personal thermal management. She received her B.S. in Materials Chemistry from University of Science and Technology of China, and her M.S. and Ph.D. in Mechanical Engineering from Stanford University, with the Stanford Graduate Engineering Fellowship. Her Ph.D. research involved the development of flame-based manufacturing methods for scaling up the production of oxide nanomaterials to advance their application in solar water splitting, catalysis and electronics.

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