

Network for Computational Nanotechnology Workshop: Thermal Radiation Modeling on nanoHUB

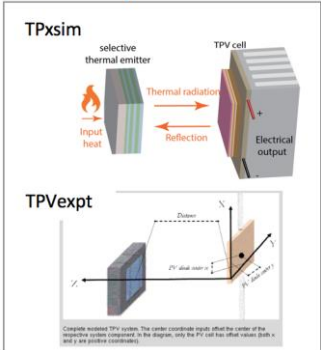
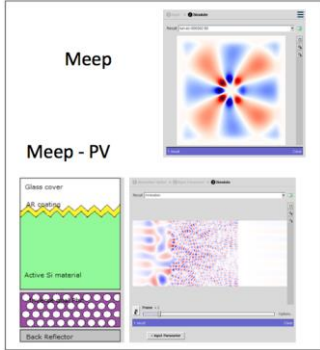
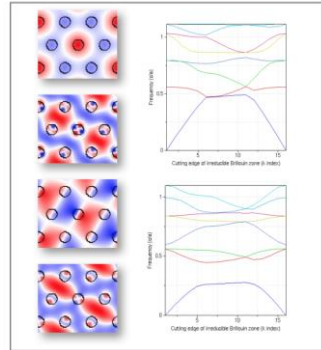
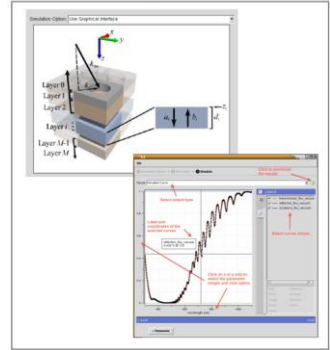
Sunday, Aug. 6, 2017, 1:00-3:00 PM
Miramar Room, Marriott Hotel

This introductory-level workshop will explain the basic principles and simulation techniques suitable for thermal radiation modeling, with particular emphasis on applications to thermophotovoltaic (TPV) systems. It will serve as a comprehensive tutorial on both optical simulations of nanophotonic emitters/absorbers, as well as entire TPV systems.

Transfer-matrix methods like S4 and time-domain simulators like MEEP will be demonstrated using a freely-available toolset available through nanoHUB, along with systematic simulations with examples of the emitter/absorber design.

Anyone who wants to design novel thermal emitters/absorbers and evaluate their performance in a TPV system will benefit from taking this workshop.

Create a free nanoHUB account (<https://nanohub.org/register>) and bring a laptop computer to access the free simulation tools, which can be found in nanoHUB's Photonics Group: [nanoHUB.org/groups/photonics](https://nanohub.org/groups/photonics)

Thermophotovoltaics	FDTD	MIT Photonic Bands	S4Sim
 <p>TPVsim: selective thermal emitter, TPV cell, Input heat, Thermal radiation, Reflection, Electrical output.</p> <p>TPVexpt: Diagram of a TPV system with labels for Diode, PV cell, and Back reflector.</p>	 <p>Meep: 3D radiation field simulation.</p> <p>Meep - PV: Cross-section of a TPV system with layers: Glass cover, Active Si material, Back reflector.</p>	 <p>MIT Photonic Bands: Band structure plots showing frequency bands for different materials.</p>	 <p>S4Sim: Simulation of a TPV system with layers (Layer 0 to Layer 12) and corresponding output plots.</p>

INSTRUCTOR

Peter Bermel is a tenure-track assistant professor of electrical and computer engineering at Purdue, whose primary research goal is to improve the performance of photovoltaic, thermophotovoltaic, and nonlinear systems using the principles of nanophotonics. Peter has published a total of 26 peer-reviewed original research articles on fundamental material science and engineering, including simulations and experiments on electromagnetic and quantum mechanical systems.

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Agenda

Time	Agenda Item	nanoHUB tools used
1:00-1:15 PM	Introduction and Setup	-
1:15-1:45 PM	Solar Heating	S4sim
1:45-2:05 PM	Radiative Cooling	RadCool
2:05-2:30 PM	Thermophotovoltaics	TPXsim; TPVexpt
2:30-2:50 PM	Photovoltaics	ADEPT; MEEPPV
2:50-3:00 PM	Wrap-up; Q&A	-

Key Materials Needed

Internet access (provided by our mifi routers)

Free nanoHUB account

Downloadable 'cheat sheet'

Downloadable discussion slides

Posted on <https://nanohub.org/groups/thermalradiation>