UNIVERSITY of HOUSTON

Cullen College of Engineering
University of Houston-Dalian Maritime University International Institute

Control Thermal Radiation Using Nanophotonics for Heat Transfer and Energy Conversion

Dr. Bo Zhao

Kalsi Assistant Professor
Department of Mechanical Engineering
University of Houston
(Dr. Zhao's lab website: https://energyzhao.github.io/)

Abstract

Radiative energy transport process plays a fundamental role in advanced heat transfer and energy conversion systems. Conventionally, the performance of these systems is subject to the fact that thermal radiation is broadband, and its intensity must be lower than the blackbody limit. In this talk, I will discuss how nanophotonics can enable us to overcome these constraints and control thermal radiation effectively. I will show how to manipulate thermal plasmon and phonon polaritons in nanostructures and 2D materials to control the spectrum of thermal radiation, and how to utilize near-field techniques to control the intensity of photon flux for super-Planckian thermal radiation. I will share new thermal and energy applications that can be enabled by controlling the spectrum and the intensity of photon transport.

Speaker Biography

Bo Zhao received his Ph.D. in Mechanical Engineering from the Georgia Institute of Technology in 2016. He was a postdoctoral research associate at Stanford University in Electrical Engineering before joining the University of Houston as an assistant professor in 2021. His research interests are thermal radiation and photonics and their applications in advanced energy systems. He has authored over 40 publications, including a book chapter for the Annual Review of Heat Transfer and one patent on near-field photon transport. Several of his works were recognized as "highly cited" or selected as journal covers. He is among the authors who pioneered the early works on nonreciprocal thermal radiation, enhanced photon transports in far-field and near-field radiative heat transfer, and high-performance photon-mediated energy conversion technologies. He received the best poster award at the 2013 ASME International Mechanical Engineering Congress & Exposition, and now he is leading the Thermal PhotoniX (TPX) Lab at the University of Houston.

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