Proceedings of the 10th International Symposium on Radiative Transfer, RAD-23
Thessaloniki, Greece, 12–16 June 2023

RAD-23 IR06

CONTROLLING THE ENZ PROFILE FOR BROADBAND NONRECIPROCAL THERMAL EMITTERS WITH HIGH CONTRAST BETWEEN EMISSIVITY AND ABSORPTIVITY

Changkang Du and Bo Zhao[1]

Department of Mechanical Engineering, University of Houston, Houston, TX 77204, USA

ABSTRACT. Recent advances have revealed exciting new opportunities of nonreciprocal thermal emitters for photon-mediated thermal and energy applications by breaking Kirchhoff's law of radiation. However, most nonreciprocal emitters reported can only achieve high contrast between emissivity and absorptivity in a relatively narrow frequency and angular range, limiting their wide applications. Emitters consisting of multiple semiconductor layers with different doping levels have attracted a lot of attention for the fabrication feasibility and promises for achieving broadband nonreciprocal thermal emission due to epsilon-near-zero response. However, there has not been a systematic study on how the multilayers should be arranged for optimal performance. In this work, we study the effect of doping profile on nonreciprocal thermal radiative properties. By optimizing the arrangement of the layers, we achieve a contrast of 0.6 between emissivity and absorptivity, highest contrast in this system to the best of our knowledge.

[1] Corresponding Author: bzhao8@uh.edu.