Mechanical & Aerospace Engineering

seminar

Recent Theoretical and Experimental Studies on Near-Field Thermal Radiation

February 26, 2016 at 1:30pm in SCOB 228

abstract

Near-field thermal radiation holds promise for high-throughput thermophotovoltaic devices, nanomanufacturing, thermal imaging, local heat removal, and vacuum thermal rectifiers, especially when the vacuum gap separating the structures is reduced to submicron distances. In addition to bulk materials that support surface plasmon polaritons or surface phonon polaritons, various micro/nanostructured materials have been considered for enhancing the radiative heat flux, such as doped silicon nanowires and nanoholes, carbon nanotubes, multilayers, gratings, and graphene sheets. This presentation will summarize some of our recent theoretical studies on photon tunneling in nanostructures considering metamaterials, metasurfaces, and plasmonic graphene sheets. Experimental measurements of near-field thermal radiation between 10 mm x 10 mm doped silicon plates at distances down to below 500 nm will also be presented.

biosketch

Zhuomin Zhang earned a Ph.D. degree from MIT and worked at NIST and University of Florida prior to joining Georgia Tech, where he currently is a professor in mechanical engineering. He received his B.S. and M.S. degrees from the University of Science and Technology of China (Hefei). He is a Fellow of the American Association for the Advancement of Science (AAAS), the American Society of Mechanical Engineers (AMSE), and

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biosketch cont'd the American Physical Society (APS). Professor Zhang's research interests are in micro/nanoscale heat transfer especially thermal radiation for energy conversion and temperature measurement. He has written a book on Nano/Microscale Heat Transfer, co-authored over 160 journal papers, and given over 300 invited and contributed presentations. His former students have established independent careers at major universities or industry in the United States, China (mainland and Taiwan) and South Korea. In addition, Professor Zhang has supervised many visiting scholars, postdoctoral fellows and undergraduate student researchers. He currently serves as an associate editor of the Journal of Heat Transfer and Journal of Quantitative Spectroscopy & Radiative Transfer. He served as the Program Chair of the ASME 3rd Micro/Nanoscale Heat & Mass Transfer International Conference (Atlanta, March 2012), Chair of the 2nd International Workshop on Nano-Micro Thermal Radiation (Shanghai, June 2014), and General Chair for the ASME 5rd Micro/Nanoscale Heat & Mass Transfer International Conference (Singapore, January 2016). Professor Zhang was a recipient of the 1999 Presidential Early Career Award for Scientists and Engineers (PECASE) and the 2015 ASME Heat Transfer Memorial Award (in the Science category). He has also won a number of teaching, research, and best paper awards.