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Controlling Surface Radiative Properties with Solid Micro/ Nanostructures

Abstract: Spectral and directional control of thermal radiation is a challenging yet important task for a number of applications, including thermophotovoltaic energy conversion, solar energy utilization, space thermal management, and high-efficiency incandescent lamps. Surface plasmon polaritons and surface phonon polaritons have been extensively studied using prisms, gratings and photonic crystals. There has been great excitement in the past decade with the discovery of a new type of material, metamaterial, which exhibits exotic properties, such as a negative refractive index, invisible cloaking, near-field imaging. The uniqueness of metamaterials is the ability to create a magnetic resonance, also called magnetic polaritons. I will give an overview of our recent theoretical and experimental research in controlling the spectral and directional thermal radiative properties using subwavelength periodic gratings, truncated photonic crystals, Fabry-Perot optical cavities, vertically aligned carbon-nanotube arrays, and metamaterials that support magnetic polaritons.

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Biography: Zhuomin Zhang is a professor of mechanical engineering at Georgia Tech. He received his B.S. and M.S. degrees in engineering thermophysics from the University of Science and Technology of China (USTC), Hefei, and a Ph.D. degree in mechanical engineering from MIT. He worked at the National Institute of Standards and Technology and the University of Florida prior to joining Georgia Tech. Professor Zhang's research interests are in the areas of micro/nanoscale heat transfer, with applications to energy conversion, optoelectronic devices, and semiconductor manufacturing. He has written a textbook on *Nano/Microscale Heat Transfer* and authored/co-authored some 130 journal papers and 8 book chapters, received 2 patents, and given over 120 invited and 140 contributed presentations. Professor Zhang is a Fellow of AAAS and ASME. He was a recipient of the Pi Tau Sigma Outstanding Teacher Award for 1997, the Sigma Xi Junior Faculty Research Award for 1999, the Presidential Early Career Award for Scientists and Engineers (PECASE) for 1999, the Heat Transfer Division Best Paper Award for 2000, the AIAA Thermophysics Best Paper Award for 2005, and the ICHMT's Hartnett-Irvine Award for 2010. He is an associate editor of the ASME *Journal of Heat Transfer*, *Journal of Quantitative Spectroscopy & Radiative Transfer*, and *International Journal of Thermophysics*.