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2D Thermal Imaging of the Surfaces of Optoelectronic Devices by Thermoreflectance Microscopy M. FARZANEH, D. LÜERßEN, Mount Holyoke College, Massachusetts Institute of Technology, P. MAYER, R. J. RAM, Massachusetts Institute of Technology, JANICE A. HUDGINGS, Mount Holyoke College
— For the last 40 years, thermoreflectance has been used to experimentally validate bandstructure calculations for semiconductor and metallic materials. The recent development of high resolution thermoreflectance microscopy as a noninvasive, 2D thermal imaging technique, based on measuring the variations of the surface reflectivity with temperature opens new avenues of probing the nanoscale properties of materials and devices. Recently, we have demonstrated that by utilizing stochastic resonance a thermal resolution of 10mK can be achieved, which exceeds the quantization limit of the camera by two orders of magnitude. Here, we report the use of thermoreflectance to characterize a photonic integrated circuit comprised of cascaded semiconductor optical amplifiers. Optical cooling of the biased amplifiers by 0.5K is observed which demonstrates the high spatial and thermal resolution achievable with stochastic resonance enhanced thermoreflectance microscopy.

Maryam Farzaneh

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