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Profiling the Local Seebeck Coefficient with Nanometer Resolution Using Scanning Thermoelectric Microscopy (SThEM)[1] YEN-HSIANG LIN, JENNA WALRATH, Physics, University of Michigan, RACHEL GOLDMAN, Materials Science & Engineering, University of Michigan — Thermoelectric (TE) devices offer a method of recovering waste heat through solid state conversion of heat to electricity. Nanostructured thermoelectric materials may provide the key to increased efficiencies, which are sensitive to the Seebeck coefficients (S) However, traditional bulk measurement techniques can only provide a spatially averaged measurement of S over the whole sample, which can hardly investigate the effects of nanostructures on S on the nanoscale. A novel technique known as scanning thermoelectric microscopy (SThEM) has recently been developed to measure induced thermal voltages with nanometer resolution In SThEM, an unheated scanning tunneling microscopy tip acts as a high-resolution voltmeter probe to measure the thermally-induced voltage, V, in a heated sample. Here we present a local S measurement using SThEM across an InGaAs P-N junction. The thermovoltage shows an abrupt change of sign within 10 nanometers, which reveals nanometer spatial resolution. We will discuss local S measurements of AlAs/GaAs superlattices (SLs) with various SL periods and compare the local S with scanning tunneling spectroscopy measurements, which will reveal how local electronic states influence thermoelectric properties.

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