The main focus of this work is to improve the performance of thermoelectric (TE) infrared (IR) detectors. TE IR detectors are a subcategory of uncooled detectors that can operate at room temperature. These detectors have been around for many years, however, their performance has been lower than their contestants. A novel high-responsivity uncooled thermoelectric infrared detector is designed, fabricated, and characterized. This detector features a single stand-alone polysilicon based thermocouple covered by an umbrella-like optical cavity IR absorber. The sub-micron polysilicon wires are the only heat path from the detector to the substrate (no supporting membrane), hence a superior thermal isolation is achieved. The improvement in performance is mainly due to low thermal conductivity of thin polysilicon wires. A test feature is designed and fabricated to characterize the thermal conductivity of such wires and it is shown that the thermal conductivity of these sub-micron wires/films is much lower than that of the bulk. The high performance in a compact and manufacturable design elevates the position of thermoelectric IR sensors as a candidate for low-power, and inexpensive focal planar arrays.

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The public is welcome to attend.