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IR Detectors and Focal Plane Arrays V
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High Performance Uncooled Thermopile Linear Arrays

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Oral or Poster Presentation

Thermopile infrared detectors offer a simplicity of system requirements that make them ideal for some applications. The y typically operate over a broad temperat ure range and are insensitive to drifts in substrate temperature. They arc passive devices, generating a voltage output without bias. If thermopiles arc read out with high input impedance amplifiers they exhibit negligible $1/f$ noise since there is no current flow. They typically have high linearity over many orders of magnitude in incident infrared power. A NASA funded development effort at J PL has prod uced 42 and 64 element linear arrays of micro machined thermopile detectors on si 1 icon substrates. These detectors are 1.5 mm long with a pixel pitch of 75 µm, matching the geometry of a breadboard ultra-compact point spectrometer. Each micromachincd detector consists of a suspended silicon nitride membrane with 11 thermocouples composed of sputtered Bi-Te and Bi-Sb-Te films. At room temperature these devices exhibit dc D* values of 1.4×10^{0} cmHz$^{1/2}$/W, dc responsivities of 1200 V/W when viewing a 1000 K blackbody source, and response times of 90 ms. The only measured source of noise above 20 mHz is Johnson noise from the 42 kΩ detector resistance. With a thin platinum absorbing layer, the infrared response is nearly constant from 5-20 µm.

Key Words: Infrared, Detector, Thermopile, Uncooled

Dr. Marc C. Foote is a member of the technical staff in the Microdevices Laboratory at JPL. His work at JPL has included the development of high temperature superconducting films and devices, superconducting bolometers and thermopile infrared detectors.