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Holey Silicon-Based Thermopiles For High-Sensitivity Broadband Thermal Detection

Tech ID: 34350 / UC Case 2022-99E-0

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OTHER INFORMATION

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BRIEF DESCRIPTION

A novel thermopile technology using holey silicon enables highly sensitive broadband thermal detection across the entire electromagnetic spectrum.

FULL DESCRIPTION

This innovative technology introduces thermopiles constructed from holey silicon, a thin silicon membrane with a microfabricated pore structure designed to minimize heat loss and optimize thermoelectric response. It achieves breakthrough sensitivity and broadband radiometric performance for detecting temperatures of both hot and cold objects without the need for cooling. The design's high sensitivity detection across a range of wavelengths while minimizing heat loss, vastly out-performs existing thermopiles and photon detectors.

SUGGESTED USES

- » Defense and security thermal imaging and detection.
- » Aerospace instrumentation and planetary exploration sensors.
- » Spectroscopy and multispectral measurement systems.
- » Consumer thermal detector devices

ADVANTAGES

- » Highly sensitive broadband thermal detection spanning the full electromagnetic spectrum.
- » Minimized heat loss through microfabricated pore structure in holey silicon membranes.
- » Superior signal-to-noise ratio with up to 9 times better detectivity than prior instruments.
- » Compact size, reduced weight, and low power consumption.
- » Negligible 1/f noise and optimized pixel size for enhanced performance.
- » Operates effectively without cooling requirements typical of photon detectors.

PATENT STATUS

Country	Type	Number	Dated	Case
Patent Cooperation Treaty	Reference for National Filings	WO 2024/263494	12/26/2024	2022-99E

Patent Pending

RELATED MATERIALS

- » Cao, Jiahui & Brown, Ari-David & Lee, Jaeho. (2024). Holey Silicon-based Thermopiles for High-Sensitivity Broadband Thermal Detection in Space. SPIE Optical Engineering + Applications, Conference Paper.

