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Improvement of Thin-Film Multijunction Thermal Converters at KRISS

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Thin-film multijunction thermal converters (MJTCs) were fabricated using silicon semiconductor production and bulk micromachining. The converters consisted of a bifilar heater and thermocouple hot junctions on the $Si_3N_4/SiO_2/Si_3N_4$ membrane and cold junctions supported by the silicon frame. The voltage sensitivity of the converter was 21.41 V/W in vacuum, which is higher than 5.82 V/W in air. In the case of a 500-nm-thick heater, the ac-dc transfer differences taken at 1 V and 40 Hz were 42.1 ppm in air and 11.8 ppm in vacuum. The ac-dc transfer differences were stabilized below 1 ppm in the frequency range from 1 kHz to 500 kHz. A process of fabricating advanced converters with a thermal island under the heater to decrease ac-dc transfer difference at low frequencies was developed. In the case of the converter, the transfer difference was about 2.9 ppm at 1.0 V and 40 Hz.

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