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Effect of Operating Temperature on Electrical and Thermal Properties of Microbolometer Infrared Sensors

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The electrical and thermal parameters of microbolometer infrared sensors play an important role in determining the ultimate sensitivity of detection. This paper describes in detail the effect of varying the operating temperature (80–300 K) on the thermal and electrical properties of microbolometer infrared detectors using Ti resistive sensor elements. In the experiment, two microbolometers with different thermal conductances were employed. The parameters studied include the temperature coefficient of resistance (TCR), thermal conductance and thermal mass (heat capacitance). The measurements show that the heat capacitance increases linearly with operating temperature while the thermal conductance increases linearly at low temperatures (< 250 K) and then rapidly increases. The rapid increase in thermal conductance at elevated temperatures is mainly due to the radiated heat loss which may limit the performance of microbolometer sensors at high ambient temperatures.

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