

“Micro thermal sensor for heat detection of a biological cell”

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[Abstract]

Resonant heat sensors are developed and applied to a calorimeter for the detection of heat from a brown fat cell. The measurement principle relies on the resonant frequency tracking of a Si resonator in temperature variation due to heat from a sample, and heat is conducted from the sample in water to the Si resonator in vacuum via a Si heat guide, as shown in Figure 4. A heat loss to surrounding and a dumping in water can be reduced by placing the resonant thermal sensor in vacuum. The fabricated resonant thermal sensor shows 1.6 mK of the temperature resolution, and 6.2 pJ of the detectable minimum heat. The heat from the single cell is detected in cases without any stimulation and with stimulation. As the results, pulsed heat production and continuous heat production are observed, respectively.