Development of a Ti hot electron bolometer based on Johnson noise thermometry

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Johnson noise thermometry is an important measurement technique used to probe the thermodynamic properties of hot electrons in conductors. Based on this technique, a normal metal hot electron bolometer with high sensitivity and high saturation power has been demonstrated [1]. In this paper, we present the development of a titanium (Ti) hot electron bolometer (HEB) based on Johnson noise thermometry. The HEB consists of a micro-size Ti microbridge and a log spiral antenna. The antenna is made of niobium (Nb) and used as a superconducting Andreev reflector. We measure the power responsivity, thermal conductance and noise equivalent power (NEP) of the Ti HEB at different bath temperatures between 3 K and 12 K. To understand the thermal transport inside the Ti microbridge, we also measure the bolometers with different microbridge lengths at different temperatures. Detailed experimental results and analysis will be presented.

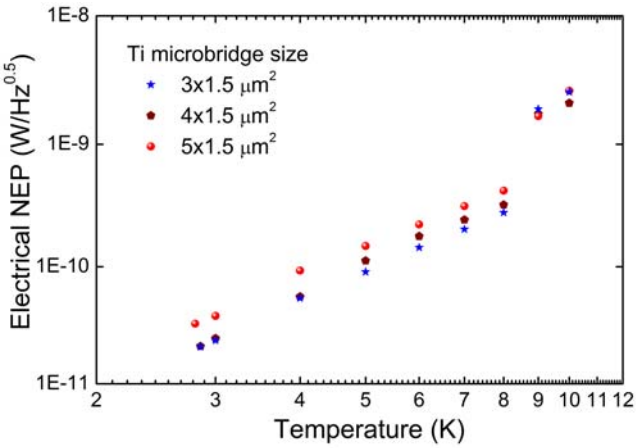

Fig. 1. Measured electrical NEP of the Ti HEBs of different microbridge lengths.

REFERENCES

[1] B.S. Karasik, C.B. McKitterick, T.J. Reck, and D.E. Prober, "Normal-Metal Hot-Electron Nanobolometer With Johnson Noise Thermometry Readout," *IEEE Transactions on Terahertz Science and Technology*, vol. 5, no. 1, pp.16 –20, Jan. 2015.

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