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Combined operation of two small pixel Ir-TESs for optical application

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We aim to realize a single-photon detector which greatly improves its sensitivity and response speed by minimizing of the thermometer volume using a single superconducting iridium thin film and electrical circuit. Iridium has a sharp superconducting transition at 112 mK in bulk, therefore, even if it is used as a single superconducting thin film for the thermometer of TES, excellent energy resolution is expected. Also, in the SPICE simulation, a simple bridge circuit with two TESs showed a current gain of 3 (LTD-17th, PB-24). Therefore, it is possible that a simple bridge circuit is attributed to improve TES response speed.
Under this concept, we have fabricated an Ir-TES for single photon detector. The Ir thin metal film and Nb electrode were deposited by an RF magnetron sputtering method on the SiN/Si/SiN wafer and formed by the lift-off method. The Ir-TES was formed into the 7 μm × 17 μm × 20 nm size (7 μm × 7 μm size of effective area). The Nb electrodes (200 nm thickness) were fabricated on the Ir film with contact area of 5 μm at both edges. We measured current-voltage characteristics of the Ir-TES at the bath temperature from 64 mK to 280 mK. We confirmed the ETF operation of the device because we observed the region where Joule heating of small pixel Ir-TES is constant. Also, we irradiated this Ir-TES with a 1310 nm wave-length attenuated pulse laser and confirmed the photon response. In addition, now we plant to perform the photon irradiation experiment using this small pixel Ir-TES with a simple bridge circuit.

Less than 5 years of experience since completion of Ph.D

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