LOW TEMPERATURE THERMOMETRY BASED ON SUPERCONDUCTOR-NORMAL METAL-SUPERCONDUCTOR JOSEPHSON JUNCTIONS

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Josephon junctions with a normal metal region (N) sandwiched between two superconductors (S) are known as superconductor- normal-superconductor (SNS) structures. A nondissipative supercurrent can flow through the normal metal between two superconductors up to a critical current I_c at finite temperature. Here we utilize the temperature dependence of critical current as a thermometer to measure the electron-phonon coupling and heat capacity of normal metal at millikelvin range. In our cases, the electron-phonon coupling measurement shows relatively high accuracy as we can measure both the electron temperature and phonon temperature at steady state simultaneously. By applying a pulse heating to the normal part, we can observe how the electron temperature of normal metal react to this heating pulse with microsecond timescale, and in this way, we can measure heat capacity and heat relaxation time of the normal metal. We measured three different materials (Au, Ag and Cu), and they all shows anomalously high electronic heat capacity compared to the prediction based on free electron model and origin of this is still under study.