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Electron heating in superconducting cuprate heterostructures and its application for advanced sensing[1] ANDREI SERGEEV, University at Buffalo, BO WEN, ROMAN YAKOBOV, SERGEY VITKALOV, City College of New York, BORIS KARASIK, Jet Propulsion Laboratory, Pasadena — Low electron density in superconducting LaSrCuO heterostructures containing quasi-two dimensional CuO layers leads to strong reduction of the interaction between electrons and thermal phonons and simultaneously to substantial enhancement of the electron-electron interaction. This hierarchy of kinetic processes provides very effective quasiparticle multiplication and slow quasiparticle relaxation and recombination. Strong heating of quasiparticles in the superconducting and resistive states makes these superconducting nanomaterials to be very attractive for various sensing applications based on electron heating. These nanostructures allow for the managing of quasiparticle relaxation rate from low values determined by the electron-phonon relaxation to high values in short devices with out-diffusion electron cooling. Therefore, LSCO heterostructures are very interesting for applications in sensitive resistive detectors, kinetic inductance detectors, and wideband mixers. We experimentally determined key material parameters, design corresponding sensors and evaluated their parameters.

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