

Transition-edge sensor based photon calorimeter for the CUPID experiment

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The CUORE Upgrade with Particle ID (CUPID) is a next-generation neutrinoless double-beta decay experiment that will require cryogenic light detectors to improve background suppression by reading out both the heat and light signals from the scintillating crystals. In this work, we describe a light detector based on a novel Ir/Pt bi-layer transition edge sensor for the first time. We have performed a systematic study of improving the electron-phonon coupling of the sensor and, thereby, its responsivity. Our very first devices easily meet CUPID's timing resolution criteria for rejecting pile-up events. The obtained energy resolution is close to CUPID's energy resolution requirement and is at present limited only by excess noise from the cryogenic apparatus. We will present the characterization and modeling of such detectors and the detector components' thermal properties. The study will inform the fabrication of future devices, culminating in the final detector designs.

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