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Simpified patterning of Mo/Cu transition edge sensors

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Superconducting/normal metal layer bilayers with tunable TC are widely used as transition edge sensors in high-resolution microcalorimeters. When these layers are patterned, channels with enhanced TC (compared to the bilayer) form along the edges of the device where the superconductor is only partially covered by normal metal. Superconductivity near the edges can be suppressed by deposition of additional normal metal to cover the exposed superconducting edges. Alternatively, the same effect can be obtained by producing an overhang in the normal metal of the bilayer by using an isotropic etch to undercut the superconductor. For Mo/Cu bilayers, however, producing a reliable undercut with a wet etch proved difficult due to electrochemical corrosion of copper in the presence of molybdenum. We are trying out an all-dry etch process to achieve the desired geometry. This achieves the desired results, but we are still working on complete characterization of the etch. This is also part of an effort to reduce longitudinal proximity and weak link effects by minimizing the amount of material with much higher or lower TC in contact with the bilayer, which should simplify the transition behavior and improve reproducibility. We are experimenting with devices that have no normal metal zebra stripes and use a minimum volume of molybdenum (TC = ~1 K) rather than niobium (TC = ~9 K) for the contacts. We will show some results using this process.

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

N

Student (Ph.D., M.Sc. or B.Sc.)

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