Platinum silicide: a step toward highly uniform MKID arrays

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We report on the development of the first kilopixel MKID arrays using platinum silicide as the superconductor. Although PtSi is very well characterized and has a wide range of room temperature applications, the material is seldom utilized for its superconducting properties. PtSi films are easily formed through an annealing process and have tunable superconducting critical temperatures as high as 1K. Our early measurements of PtSi MKIDs show high quality factors (~200,000 or higher), energy resolution of 10 at 400nm, and quasi-particle lifetimes of ~30us. Most importantly, the PtSi films have extremely high uniformity across a wafer. Current standard sputtered TiN thin films need to be sub-stoichiometric in order to achieve the desired critical temperatures for MKID applications, but sub-stoichiometric films often have wide variations in composition, causing resonant frequencies to shift away from their designed values. These shifts can cause resonators to collide in frequency space, rendering many such resonator pairs unusable in the readout and significantly reducing the total pixel yield. We find that the PtSi fabrication process is intrinsically more uniform than the sputtered TiN process while retaining a majority of its favorable qualities. This should allow for much finer frequency-domain multiplexing and nearly perfect pixel yield, improvements necessary for next-generation MKID instruments.