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Surface Participation Effects in Titanium Nitride and Niobium Resonators[1] ALLISON DOVE, JOHN MARK KREIKEBAUM, WILLIAM LIVINGSTON, REMY DELVA, YANJIE QIU, REINHARD LOLOWANG, VINAY RAMASESH, KEVIN O'BRIEN, IRFAN SIDDIQI, Quantum Nanoelectronics Laboratory, UC Berkeley — Improving the coherence time of superconducting qubits requires a precise understanding of the location and density of surface defects. Superconducting microwave resonators are commonly used for quantum state readout and are a versatile testbed to systematically characterize materials properties as a function of device geometry and fabrication method. We report on sputter deposited titanium nitride and niobium on silicon coplanar waveguide resonators patterned using reactive ion etches to define the device geometry. We discuss the impact of different growth conditions (temperature and electrical bias) and processing techniques on the internal quality factor (Q) of these devices. In particular, to investigate the effect of surface participation, we use a Bosch process to etch many-micron-deep trenches in the silicon substrate and quantify the impact of etch depth and profile on the internal Q.

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