Abstract Submitted
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Epitaxial superconducting refractory metals for quantum computing[1] D. P. PAPPAS, NIST, S. OH, K. OSBORN, K. CICAK, R.W. SIMMONDS, NIST, Boulder, CO, R. MCDERMOTT, M. STEFFEN, K. B. COOPER, M. ANSMANN, J. M. MARTINIS, UCSB, Santa Barbara, CA — The base layer for a Josephson tunnel junction is important because it defines the nanoscale morphology and roughness of the device. This can affect the critical current and the spectroscopic nature of the barrier. In this study we discuss the growth of epitaxial Re as a base layer for tunnel junctions. Studies were conducted using UHV sputtering of the metal, with in-situ characterization using STM, LEED, RHEED, and Auger. Ex-situ characterization was also conducted using AFM. We find that the Re grows oriented even at room temperature for very slow deposition. The grain size grows significantly with relatively low temperature anneals (850 C). After these anneals, we find that the grains form around a screw dislocation, with a tendency for bi-layer step bunching. However, there is evidence for occasional steps with a higher number of atomic layers (5 – 10). The impact of these steps on the IV characteristics of the tunnel barriers will be discussed.

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