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Effects of thin gold layers on performance of 2.6 GHz SRF cavity

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SRF cavities are a critical technology both for particle accelerators, where they enable high energies and efficient operation, and superconducting quantum circuits, where they enable large coherence times for qubits. In both applications, the need for better performing cavities with higher quality factors is clear. The native oxide that forms on the surface of niobium may be the source of conductive losses in high-energy accelerator applications and of two level system losses in low-energy quantum applications. Previous work from Cornell University studied the effect of passivating the niobium oxide on an RF sample plate with a thin layer of gold, selected for its properties as a non-oxidizing normal conductor. At sub-nanometer thicknesses, the sample showed an increased quality factor. In this paper, we report first RF results scaling up the treatment for full-scale cavity testing using electrochemical deposition of gold on a 2.6 GHz niobium SRF cavity. We also report sample imaging characterizing the growth of thin gold films on niobium, and DFT calculations on the effect of gold on the presence of oxygen impurities in niobium.

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Yes

Footnotes

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