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Supercritical Fluid-Assisted Processing of Superconducting Al Resonators CHRISTOPHER BARRETT, CYNTHIA WARNER, BRUCE AREY, SHUTTHANANDAN VAITHIYALINGAM , MARVIN WARNER, Pacific Northwest Natl Lab, NATHAN SIWAK, CHRISTOPHER RICHARDSON, Laboratory for Physical Sciences — Microfabrication-induced processing artifacts have been shown to limit the coherence times of both planar and 3D superconducting qubits. Energy loss in these devices can arise as a result of interactions with two-level system defects, which are being correlated to thin layers of lossy material and/or nano-sized particulate. To this end, we present recent results from a number of different conventional and non-conventional techniques used in locating and characterizing these sources of loss on coplanar waveguide resonators. Using these observations as a metric, a novel system for supercritical fluid-assisted cleaning of superconducting aluminum features will be discussed at length. Supercritical CO_2 can serve as an effective solvent system to assist in the delivery of various co-solvents or stripping agents to even the smallest patterned features, with minimal impact to the aluminum layer. The adoption of less-invasive forms of device processing should mitigate artifact formation, translating into substantially improved coherence times.

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