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**Supercritical Fluid Assisted Cleaning of Patterned Aluminum Microstructures for Removal of Post-Processing Residue and Surface Contamination** MARVIN G. WARNER, CHRISTOPHER A. BARRETT, CYNTHIA L. WARNER, Pacific Northwest National Laboratory, CHRISTOPHER J.K. RICHARDSON, NATHAN SIWAK, Laboratory for Physical Sciences, University of Maryland — We report the development of preliminary methods for the supercritical $CO_2$ assisted removal of post-processing residue and surface contamination from delicate aluminum structures, such as those found in superconducting quantum circuits based on Josephson Junctions. The supercritical $CO_2$ serves as an effective solvent system to assist in the delivery of various co-solvents, stripping agents, and surfactants to the surface of the patterned devices without introducing harsh chemical reagents that can lead to degradation and etching of the aluminum structures. This work was conducted to determine the feasibility and benefits of inserting a supercritical $CO_2$ cleaning step into device patterning and cleaning processes. The results presented here will discuss our efforts to determine the optimal formulation, shortest exposure time, and exposure methods (*e.g.*, pulsed versus static) necessary to completely remove surface contamination while preserving the integrity of the underlying patterned aluminum structures. The methods presented here could make great strides in removing fabrication based residue and surface contamination, which has been shown to lead to decoherence in superconducting quantum circuits.

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