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Plasma Etching of superconducting radio frequency cavity by Ar/Cl_2 capacitively coupled Plasma JANARDAN UPADHYAY, SVETOZAR POPOVIC, Old Dominion University, ANNE-MARIE VALENTE-FELICIANO, LARRY PHILLIPS, Jefferson Lab, LEPSHA VUSKOVIC, Old Dominion University — We are developing plasma processing technology of superconducting radio frequency (SRF) cavities. The formation of dc self-biases due to surface area asymmetry in this type of plasma and its variation on the pressure, rf power and gas composition was measured. Enhancing the surface area of the inner electrode to reduce the asymmetry was studied by changing the contour of the inner electrode. The optimized contour of the electrode based on these measurements was chosen for SRF cavity processing. To test the effect of the plasma etching on the cavity rf performance, a 1497 MHz single cell SRF cavity is used, which previously mechanically polished, buffer chemically etched afterwards and rf tested at cryogenic temperatures for a baseline test. Plasma processing was accomplished by moving axially the inner electrode and the gas flow inlet in a step-wise manner to establish segmented plasma processing. The cavity is rf tested afterwards at cryogenic temperatures. The rf test and surface condition results are presented.

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