Abstract Submitted
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Plasma Processing of Large Curved Nb Surfaces with Application to SRF Cavities[1] JANARDAN UPADHYAY, DO IM, FREDERICK MILLER, SVETOZAR POPOVIC, LEPOSAVA VUSKOVIC, Center for Accelerator Science, Department of Physics, ODU, Norfolk, VA, LARRY PHILLIPS, ANNE-MARIE VALENTE-FELLICIANO, TJNAF, Newport News, VA — Surface modification of superconducting radio-frequency (SRF) cavities are a promising alternative to the wet etching technologies that are currently applied to Nb cavities. We have built a Nb etching cylindrical discharge chamber, comparable by volume to 1.5 GHz resonant cavity with 8 observation ports for holding the Nb samples, spectral observations, and electric probe measurements. Several asymmetric discharge configurations were tested with a variety of pressure, power and gas composition combinations. All discharges have been operated in Ar/Cl_2 gas mixtures with Cl_2 content up to 15%. Plasma parameters were evaluated using a Langmuir probe, and an optical emission spectroscopy based on the relative intensities of two specific Ar 5p-4s lines at 419.83 and 420.07 nm, respectively. We have also carried out a systematic study of atomic and molecular spectra during Nb etching in order to determine the most appropriate process signature. The effects of discharge conditions and parameters are intended to be used as guidelines for optimal design of SRF cavity etching processes.

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