

Abstract Submitted
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New developments in Nb surface modification using a cylindrically symmetric capacitive discharge¹ JEREMY PESHl, Old Dominion University, MILKA NIKOLIC, University of San Francisco, JANARDAN UPADHYAY, Los Alamos National Laboratory, SVETOZAR POPOVIC, ALEXANDER GODUNOV, LEPOSAVA VUSKOVIC, Old Dominion University — We performed the ion-assisted reactive ion etching of a single cell Superconducting Radio Frequency (SRF) cavity made of pure Niobium (Nb) in a capacitive rf Ar/Cl₂ discharge with cylindrical symmetry. The first rf test of a plasma etched SRF cavity at cryogenic temperature has shown no field emission, which did not increase even after multiple chemical cleanings and testing. The absence of field emission is interpreted by the effect of plasma wake field on the SRF cavity walls. In addition, we will present effects of the etching parameters on the surface roughness of cavity grade Nb. Efforts on the development of plasma diagnostics employing different line intensity ratio techniques to evaluate emission spectroscopy data and deduct plasma parameters will be presented. A comparison of the spectral data from an Ar plasma and an Ar/Cl₂ plasma show an interesting influence of DC bias – a necessary parameter in the etching of the larger surface electrode – on the electronegative characteristics of the Ar/Cl₂ plasma.

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Jeremy Peshl
Old Dominion University

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