

# **ACCELERATOR SEMINAR**

## **Secondary Electron Emission from Plasma Processed Accelerating Cavity Grade Niobium**

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The Secondary Electron Emission (*SEE*) is a phenomenon that causes the increase in the number of free electrons within the accelerator cavity, which can cause degradation in the cavity performance. Even though the phenomenon has been identified over a century ago, there are still no effective means of controlling it. Plasma processing of niobium (Nb) samples was shown to be an effective method to reduce the Secondary Electron Yield (*SEY*) and with recently developed experimental setup for processing the SRF cavities it may provide the method to improve the cavity performance.

We have developed the experimental setup to study the *SEY* as a function of the location within the cavity. Specifically, the goal of this work was to determine the *SEY* of cavity grade niobium (Nb) as a function of the incident angle of the primary electron beam and the characteristic microstructures found within the SRF cavity. The characteristic surfaces/microstructure that were analyzed included the weld, heat affected zone, and areas away from the weld. The effect of processing with two different plasma chemistries (nitrogen ( $N_2$ )) and a mixture of argon and oxygen (Ar/O<sub>2</sub>)) was also examined. The *SEY* of the analyzed samples was determined before and after plasma processing as a function of the primary electron energy. The *SEY* as a function of the incident angle of the primary electrons was tested on the samples treated with Ar/O<sub>2</sub> plasma and energy distribution curves were determined.

The results showed beneficial effects of plasma on the decrease of susceptibility and increase in uniformity of the *SEY* between characteristic surfaces of the sample. Specifically, the processing in nitrogen plasma resulted in reduced variation of the *SEY* during repeated exposure of a single measurement spot to the electron beam. Plasma processing of the samples in the Ar/O<sub>2</sub> gas mixture leveled the *SEY* magnitude across the characteristic surfaces. However, the average *SEY* measured on the sample increased after plasma processing due to the air exposure of the samples.

**Friday, April 22, 2016**

**11:00 a.m.**

**CEBAF Center, Room L102**

**Coffee before seminar beginning at 10:45 p.m.**