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Preliminary tests of plasma cleaning as an in-situ superconducting RF cavity cleaning technique

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Oxygen plasmas have shown promise for removing surface and diffused hydrocarbons from niobium in superconducting RF cavities. These techniques are strong candidates for in-situ cleaning techniques for installed accelerating cavities. The goal is to improve the performance of cavities that have degraded over time, without removing them from their cryomodule. By varying the governing parameters of the plasma, the primary cleaning method can be varied between a primarily physical process (sputtering) and a primarily chemical process. We extend this work from organic contaminants to more general contaminants, including metallic species. These preliminary tests are primarily concerned with characterizing the cleaning power of various plasma compositions. A variety of gas species are used to create different plasma compositions, including Ar, Ne, O_2, N_2, H_2, and He. Cleaning power is determined by performing surface characterization analysis on room-temperature niobium samples before and after plasma treatment. Samples are maintained in a clean environment between characterization and treatment, to prevent surface recontamination. Measurements of surface contamination and surface character are presented.

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