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An overview of plasma processing of SRF cavities at JLAB

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Plasma processing is a common technique where the free oxygen produced in a low-pressure RF plasma breaks down and removes hydrocarbons from surfaces. This increases the work function and reduces the secondary emission coefficient of the treated surfaces. Jefferson Lab has an ongoing R&D program in plasma processing. The experimental program investigated processing using argon/oxygen and helium/oxygen gas mixtures. The initial focus of the effort was processing C100 cavities by injecting RF power into the HOM coupler ports. We also developed the methods for establishing a plasma C75 cavities where the RF power is injected via the fundamental power-coupler. As part of the process development we processed, three C100 cryomodules in our off-line cryomodule test facility. In May 2023 we processed four C100 cryomodules in-situ in the CEBAF accelerator with the cryomodules returning to an operational status in Sept. 2023. The improvement in field emission free operation, as measured on a cavity by cavity basis, was 59 MeV or 24%. At the time that this abstract was written, the plans are to process an additional 5 to 7 cryomodules in the CEBAF accelerator in the summer of 2024. Methods systems and results from processing cryomodules and individual cavities in the vertical test will be presented. Current status and future plans will also be presented.
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Footnotes

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