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Electropolishing Copper Substrates for Niobium Thin-Film Coatings in SRF Technologies¹ ANDREA CARLINI, Virginia Tech, ANNE-MARIE VALENTE-FELICIANO, Jefferson Laboratory — Electropolishing (EP), the electrochemical removal of contaminants and microscopic smoothing of metallic surfaces, has been used for surface preparation of superconducting radio frequency (SRF) cavities. Cu substrate EP is particularly useful for Nb thin-film coatings as surface roughness and impurities can negatively influence the efficiency of these superconductors. During the EP process, Cu atoms on the highest peaks of the surface ionize and travel away from the substrate, resulting in a smoothing of the surface. The focus of this project was to improve Cu EP by optimization of various parameters. Here it is shown that a high and low current density (J) was identified for optimum polishing. Variables such as bath age, previous mechanical polishing, time, electrode distance, and J combinations were tested to analyze the effect on Cu samples. The results indicate that considerable leveling of the copper surface is achievable through optimization of the considered parameters. Significant improvements in the efficiency and maximum accelerating field of Cu/Nb cavities may be achievable through this improved process.

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