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Origins of quench in buffered chemical polished and low temperature baked SRF cavities

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Electropolishing (EP) and buffered chemical polishing (BCP) are conventional surface preparation techniques for superconducting radiofrequency (SRF) cavities that remove damaged material from the cavity surface. One main issue with EP and BCP treated SRF cavities is high field Q-slope (HFQS), a drop in quality factor at high gradients that limits quench field. High gradient performance in EP cavities can be improved by applying a low temperature bake (LTB), but LTB does not consistently remove HFQS in BCP cavities. There is no consensus as to the why LTB is not effective on BCP prepared cavities, and the cause of HFQS in BCP cavities is not well understood. We examine the origins of quench in EP, BCP, EP+LTB, and BCP+LTB treated SRF cavities. We also show the effect of these treatments on the onset of HFQS, heating within the cavity up to quench, concentration of free hydrogen, and surface roughness.

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Footnotes

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Yes

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