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Detailed surface morphological studies of Nb_3Sn treated by controllable bipolar pulsed electropolishing

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Post-coating surface treatment is a crucial approach for eliminating surface flaws and enhancing the RF performance of Nb_3Sn. The bipolar pulsed electropolishing (BPEP) technique, originally developed for Nb, is adaptable to Nb_3Sn and offers precise, controllable surface removal at slow rates—an essential feature for this application. In BPEP, the net removal rate is proportional to the repetition frequency and can be controlled with nanometer-scale precision, down to a few angstroms per pulse. The BPEP process enables highly controlled surface finishing by engineering the anodic/cathodic potential and pulse duration. Adjusting these parameters in response to surface morphology changes can further optimize the process. Our systematic BPEP morphology studies on Nb samples demonstrate that removal rate and uniformity can be finely tuned. The advantages of BPEP for Nb_3Sn extend beyond Sn vapor-diffusion deposited Nb_3Sn/Nb cavities; it is a versatile technique applicable to any Nb_3Sn-coated SRF cavity, offering a promising path for improving surface quality and RF performance.

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Yes

Footnotes

Funding Agency

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