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Progress on theory of nanohydride dissipation

Tuesday 23 September 2025 14:30 (3 hours)

We present further progress on a theoretical model linking nanohydride formation to mid- and high-field Q-slope in SRF cavities. Using time-dependent Ginzburg-Landau theory, we calculate Q-vs-E curves for cavities with a range of hydride distributions corresponding to different global hydrogen concentrations and different distributions of hydride nucleation sites. We show that hydrides smaller than one coherence length in radius have a minor effect on dissipation, even at high fields and high overall hydrogen concentrations. In contrast, hydrides significantly in excess of one coherence length in radius tend to invite flux vortex nucleation and significantly reduce quality factor even at modest fields and lower overall hydrogen concentrations. We conclude that disorder induced by other dissolved impurities may serve to increase the number of hydride nucleation sites, reducing the typical size of nanohydrides beneath the critical coherence length threshold and improving high-field quality factor.

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Yes

Footnotes

Funding Agency

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