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Next-generation SRF cavities with energetic condensation

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The development of energetic condensation techniques has resulted in exceptional Nb film quality and improved Nb/Cu RF performance. Progress is continuously made in exploiting film forming and energetic processes to tailor the final film RF response. Convergence of parameters is emerging across techniques such as electron cyclotron resonance (ECR) and high power impulse magnetron sputtering (HiPIMS). The lessons learned also enable the development of NbTiN and Nb₃Sn in single and multilayer structures.

The resulting RF performance is studied with large quadrupole resonator samples and 1.3 GHz cavities at different temperatures, along with the cooldown effect and sensitivity to external applied magnetic fields. In conjunction, material and superconducting properties of the films and structures are evaluated with microscopy and magnetometry techniques to gain insight into various processes influence on the residual and flux induced surface resistances.

This contribution presents the latest progress in exploiting processes involved in energetic condensation towards RF Q-slope mitigation for Nb/Cu films and the development of alternative superconductors and layered structures.

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