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SIS multilayer studies and status of the new cavity-coating system at University of Hamburg

Tuesday 23 September 2025 10:10 (20 minutes)

Theories predict that Superconducting-Insulating-Superconducting (SIS) multilayers delay vortex penetration allowing for operation gradients more than twice of bulk Nb cavities and significantly higher Q-values [1]. The University of Hamburg focuses on Atomic Layer Deposition (ALD) as the most promising technique to coat SIS multilayers. A proof-of-principle experiment to coat cavities with an insulator has been successfully carried out, and the complex coating process was numerically modelled, which resulted in a further process time reduction while maintaining the high film quality [2,3]. For SIS multilayer deposition, plasma-enhanced ALD (PEALD) is used to deposit AlN and NbTiN as dielectric and superconducting material, respectively. The deposition process and post-deposition treatments have been optimized by studying the superconducting properties of the NbTiN thin film [4]. Moreover, properties such as flux-trapping behaviour and thermal transmittance of SIS multilayers have been measured. Furthermore, various material characterization techniques were applied to investigate the contribution of vacancy densities, recrystallization eVects due to the annealing past the deposition and the impact of the insulating layer on the properties of SIS multilayers. This talk will show the aggregated results of all those measurements and present the status of the PEALD single-cell cavity coating device at the University of Hamburg.

I have read and accept the Privacy Policy Statement

Yes

Footnotes

[1] A. Gurevich, Applied Physics Letters 88, 12511 (2006).
[2] Wenskat. M, Deyu. G. et al., Superconductor Science and Technology 36.1 (2022): 015010.E.
[3] Deyu, G., et al., Chemistry of Materials 36.6 (2024): 2846-2856.
[4] I. Gonzalez Diaz-Palacio et al., Journal of Applied Physics, vol. 134, no. 3, p. 035301, 2023.

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