SRF2025 TOKYO

22ND INTERNATIONAL CONFERENCE ON RF SUPERCONDUCTIVITY

September 21-26, 2025

Contribution ID: **89** Contribution code: **TUP17** Type: **Student Poster Presentation**

Characterization of multilayer SRF cavity materials using radioactive beam based techniques for gradient enhancement

Tuesday 23 September 2025 14:30 (3 hours)

Coating Nb with thin superconducting layers (with or without insulating layers, i.e., SS or SIS) with longer penetration depth λ can enhance the accelerating gradient by maintaining the Meissner state above each layer's superheating field Bsh, due to reduced surface screening currents and interfacial energy barriers. We review previously published studies using radioactive beam-based techniques to investigate SS and SIS for increasing accelerating gradient. Muon spin rotation (μSR) measurements of Nb3Sn(2 μm)/Nb samples revealed interfacial energy barriers through depth profiling of the first-flux-penetration field Bvp, consistent with Nb's metastable Bsh. Low-energy μSR study at depths <=˜ 150 nm in SS Nb1-xTixN/Nb samples confirmed nanoscale current suppression and a bipartite Meissner screening profile, supporting the "counter-current" model and identifying optimal coating thickness for maximizing Bvp. For vortex penetration study in SIS, β-detected nuclear magnetic resonance (βNMR) study optimizes the superconducting and normal-state properties of Nb0.75Ti0.25N in Nb0.75Ti0.25N(91 nm)/AlN(4 nm)/Nb. Resonance measurements in the vortex state showed broadening below Tc ˜ 15 K, yielding λ near the intrinsic limit, while spin-lattice relaxation exhibited a metallic Korringa response modified below Tc by a Hebel-Slichter coherence peak.

I have read and accept the Privacy Policy Statement

Yes

Footnotes

Funding Agency

Author: ASADUZZAMAN, Md (University of Victoria)

Co-authors: Dr MCFADDEN, Ryan M. L. (TRIUMF; University of Victoria); Mr THOENG, Edward (TRIUMF; University of British Columbia); VALENTE-FELICIANO, Anne-Marie (Thomas Jefferson National Accelerator Facility); Mr BEVERSTOCK, David R. (Thomas Jefferson National Accelerator Facility); Dr SUTER, Andreas (Paul Scherrer Institute); Dr SALMAN, Zaher (Paul Scherrer Institute); Dr PROKSCHA, Thomas (Paul Scherrer Institute); KALBOUSSI, Yasmine (Commissariat à l'Energie Atomique); PROSLIER, Thomas (Université Paris-Saclay); Dr LI, Ruohong (TRIUMF); Dr MORRIS, Gerald D. (TRIUMF); Dr DUNSIGER, Sarah R. (TRIUMF); MACFARLANE, W. Andrew (TRIUMF; University of British Columbia); LAXDAL, Robert (TRIUMF); JUNGINGER, Tobias (TRIUMF; University of Victoria)

Presenter: ASADUZZAMAN, Md (University of Victoria)

Session Classification: Tuesday Poster Session

Track Classification: MC2: Fundamental SRF research and development