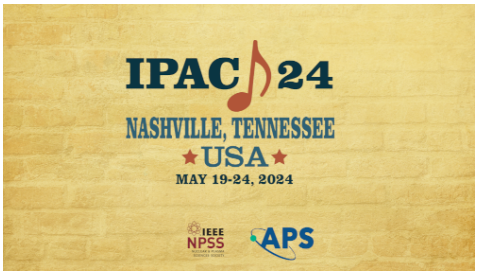

Contribution ID: **2240** Contribution code: **SUPG078** Type: **Poster Presentation**

Microscopic understanding of the effects of impurities in low RRR SRF cavities

Sunday, 19 May 2024 16:00 (2 hours)

The SRF community has shown that introducing certain impurities into high-purity niobium can improve quality factors and accelerating gradients. We question why some impurities improve RF performance while others hinder it. The purpose of this study is to characterize the impurities of niobium coupons with a low residual resistance ratio (RRR) and correlate these impurities with the RF performance of low RRR cavities so that the mechanism of impurity-based improvements can be better understood and improved upon. The combination of RF testing, temperature mapping, frequency vs temperature analysis, and materials studies reveals a microscopic picture of why low RRR cavities experience low BCS resistance behavior more prominently than their high RRR counterparts. We evaluate how differences in the mean free path, grain structure, and impurity profile affect RF performance. The results of this study have the potential to unlock a new understanding on SRF materials and enable the next generation of high Q/high gradient surface treatments.

Footnotes

Funding Agency

This manuscript has been authored by Fermi Research Alliance, LLC under Contract No. DE-AC02-07CH11359 with the U.S. Department of Energy, Office of Science, Office of High Energy Physics.

Paper preparation format

LaTeX

Region represented

North America

Primary author: HOWARD, Katrina (University of Chicago)

Co-authors: BAFIA, Daniel (Fermi National Accelerator Laboratory); SUNG, Zu-Hawn (Fermi National Accelerator Laboratory); DZIEDZIC-MISIEWICZ, Wieslawa (Fermi National Accelerator Laboratory); KIM, Young-Kee (University of Chicago)

Presenter: HOWARD, Katrina (University of Chicago)

Session Classification: Student Poster Session

Track Classification: MC7: Accelerator Technology and Sustainability: MC7.T07 Superconducting RF