



TFSRF 11th EDITION
*THIN FILMS AND NEW IDEAS FOR PUSHING
THE LIMITS OF RF SUPERCONDUCTIVITY*

SEPTEMBER 16 TO 20, 2024

Nb₃Sn

Hot Topic Discussion

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COATING PROCESSES

- Sn Vapor Diffusion on Nb, Nb₃Sn on Cu by DCMS, Dual Magnetron, Nb₃Sn on Cu by HiPIMIS, Bronze Route, ... If we need a result soon, better focus on one technology or diversify the R&D?
- Tc of HiPIMIS coatings increases reducing PP. Is still HiPIMIS giving advantages in this regime?
- Substrate has a role. What is the driven property? Barrier layer, thermal dilatation, lattice parameter? Alternative to Nb thick layers. Can energy of the adatoms reduce the substrate effect? (see STFC results)
- Tin rich clusters on top of Nb₃Sn
 - Are an issue for RF?
 - How to reduce/remove
 - Differences along different coating techniques?

SUBSTRATE

- Cu limits coating temperature. What is the T limit? Softening? Brazing process?
- Cu softening appears at T>400-450 °C. Is still suitable for RF?
- Alternative to Cu?

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CAVITY COATING SET-UP AND TARGET

- Which cavity for R&D? 1.3 GHz is a standard, 800 MHz possible to implement in FCC
- The R&D should focus on optimizing such that a minimum of movement is required (dust management, interfaces, High temperature compatibility...)
- Cylindrical Configuration allows simpler set-up but target availability is an issue. Any idea for producing Nb₃Sn cylindrical targets? (in addition to Sn liquid diffusion)
- Rectangular target with rotating cavity is a challenge: dust management, interfaces, High temperature compatibility...
- Dual target appears as needed (diffusion barrier layer) and/or at least a possibility not to exclude depending on further needs (capping layer etc.). In situ or ex situ depositions? Should we even think about a hybrid ALD/PVD system?
- One should consider, during cavities coating, that the manipulation of the cathode shall be reduced to the very minimum required and thus should have an as long as possible lifetime
- How to get a target that will survive within an object heated up to high temperature?
- Target cracking – a massive concern for a device that is dust sensitive

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- Cold Tuning (180 HKz) possible on Nb₃Sn on Nb → We have to expect differences in Nb₃Sn on Cu?
- Characterization Techniques
 - Specific characterizations to test Nb₃Sn quality/performances?
- Theoretical limitations for Nb₃Sn
 - Are High Gradient achievable? → PCT Measurement can predict it?
 - Is Nb R_s achievable? (Possible role of Flux Trapping)
- Are Nb₃Sn coated cavities actually viable?
 - One should seriously consider evaluating the real cost of producing such a cavity and compare to the actual operation gain depending on the application