



Contribution ID: 5

Type: Oral presentation

## Electrochemical deposition for generating Nb<sub>3</sub>Sn films with low surface roughness and stoichiometry

*Thursday, November 12, 2020 11:20 AM (25 minutes)*

Reducing surface roughness and attaining stoichiometry of Nb<sub>3</sub>Sn superconductors are required for radio-frequency accelerator applications. We explore the electrochemical deposition of Sn, Nb, and Nb-Sn films, and also investigate the thermal annealing of the plated films to Nb<sub>3</sub>Sn. Current progress shows that high quality Sn pre-depositions via electroplating on the Nb surface can significantly reduce the surface roughness of the resultant Nb<sub>3</sub>Sn superconductors with pure stoichiometry, owing to sufficient Sn supply and uniformly distributed events during nucleation. We find that the surface roughness of Nb<sub>3</sub>Sn is minimized to an average roughness of 65 nm that is 5 times lower than the values from conventional vapor diffused samples. Fast Fourier transformation tests confirm a dramatic reduction in power intensity at medium spacial frequencies that are important for moderating the field enhancement. Structural and superconducting property measurements demonstrate a Nb<sub>3</sub>Sn A15 phase with a stoichiometry of 25 at% Sn that is crucial to the superconducting properties and thus achieving a high critical temperature of 18 K (Nb<sub>3</sub>Sn limit) at zero magnetic field. Ongoing efforts include the electrochemical deposition of Nb and Nb-Sn films, and they will also be briefly discussed in the workshop.

**Primary authors:** SUN, Zeming (CLASSE); PORTER, Ryan; BARAISSOV, Zhaslan; DOBSON, Kevin D. (Institute of Energy Conversion); SITARAMAN, Nathan; KELLEY, Michelle (Cornell); HOWARD, Katrina (CLASSE); OSEROFF, Thomas; GE, Mingqi (Cornell University); DENG, Xiaoyu (University of Virginia); HIRE, Ajinkya (Graduate Student- University of Florida); CONNOLLY, Aine (Cornell University); THOMPSON, Michael O. (Cornell University); HENNIG, Richard; SETHNA, James; MULLER, David; ARIAS, Tomas; LIEPE, Matthias

**Presenter:** SUN, Zeming (CLASSE)

**Session Classification:** Growth Studies

**Track Classification:** Growth studies