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Sputter coating of Nb_3Sn into SRF cavity using stoichiometric target

Wednesday 13 August 2025 16:00 (2 hours)

Nb_3Sn has emerged as a leading alternative material due to its higher superconducting critical temperature (Tc) and superheating field (Hsh), promising a viable solution to the intrinsic performance limit currently faced by Nb superconducting radiofrequency (SRF) cavities. We sputter-coated Nb_3Sn inside Nb SRF cavity using a stoichiometric Nb_3Sn tube target in a DC cylindrical magnetron sputter coater. The target was fabricated by growing an estimated >20 µm thick Nb_3Sn layer on a Nb tube via Sn vapor diffusion using Jefferson Lab' s coating system. Approximately 150 nm thick Nb-Sn films were sputter-deposited onto flat Nb samples at positions representing the beam tubes and equator of a 2.6 GHz Nb cavity. Post-deposition annealing at 950 °C for 3 h resulted in the formation of Nb_3Sn. Microstructural analysis of the annealed films was carried out to investigate the morphology and structure of the Nb_3Sn films. Later, a 2.6 GHz Nb SRF cavity was coated with a ˜1.2 µm thick sputtered Nb-Sn film using a stoichiometric Nb_3Sn target, followed by annealing. Cryogenic RF testing of the annealed cavity demonstrated a Tc of 17.8 K, indicating the formation of Nb_3Sn. After a light Sn recoating treatment, the cavity achieved a quality factor (Q0) of 6.7E+08 at lower field at 2.0 K.

Please consider my poster for contributed oral presentation

Yes

Would you like to submit this poster in student poster session on Sunday (August 10th)

Yes

Footnotes

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I have read and accept the Privacy Policy Statement

Yes

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