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Co-sputter deposition of Nb_3Sn layer into SRF cavity using Nb-Sn composite target

Wednesday 13 August 2025 16:00 (2 hours)

Nb_3Sn, with its superior superconducting critical temperature (Tc ˜18.3 K) and superheating field (Hsh ˜400 mT), is considered a promising material for superconducting radiofrequency (SRF) cavities, offering enhanced cryogenic performance compared to bulk niobium cavities. A Nb_3Sn coating technique has been developed for Nb SRF cavities using co-sputtering of Nb-Sn composite target in a DC cylindrical magnetron sputtering system. The composite target configuration and discharge conditions for co-sputtering were optimized to deposit Nb-Sn films on flat Nb substrates, followed by annealing to form Nb_3Sn. Multiple strategies have been explored to improve the surface homogeneity of the Nb_3Sn coating, including optimizing a two-step annealing process, annealing in Sn vapor, and a light Sn recoating process. A 1.5 μm Nb-Sn co-sputtered film was deposited on the interior of a 2.6 GHz Nb SRF cavity and annealed at 600 ℃ for 6 h, followed by 950 ℃ for 1 h. Cryogenic RF testing of the annealed cavity demonstrated a Tc of 17.8 K, confirming the formation of Nb_3Sn. Then, the annealed cavity underwent a light Sn recoating treatment and attained a quality factor (Q0) of 8.5E+08 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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Yes

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