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Superconducting sputtered Nb3Sn films for SRF applications

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A solution to reduce the cost of superconducting radiofrequency cavities is represented by superconducting thin film coated copper substrates. This technology has shown its potential within LEP, LHC and HIE-ISOLDE machines. In all those machines the superconducting thin film was made of Nb. Among the most promising future coating materials Nb_3Sn stands as one of the best candidates. Combined to the copper substrate it would offer important benefits with respect to the bulk Nb cavities: significantly higher stability against quenching, due to the high thermal conductivity of copper and lower Bardeen-Cooper-Schrieffer (BCS) surface resistance R_{BCS} and therefore higher quality factor Q_0, owing to the high critical temperature of Nb_3Sn (˜18.2K).

This work is devoted to the investigation of Nb_3Sn thin films with the aim to produce low-loss surfaces. The synthesis of Nb_3Sn coatings was carried out on copper substrates using DC magnetron sputtering. Three different post-coating annealing temperatures were applied in order to achieve a stable A15 phase. The influence of the deposition and annealing parameters on the grain formation and superconducting properties of the system were studied.

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