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Deposition of NbTiN and NbN on 6 GHz seamless copper cavity

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Nb₃Sn, NbTiN and NbN are superconductors with a critical temperatures of 18.3, 12.6-17, 11.6-17.5 K, respectively, that are higher than that of Nb (9.3 K). Hence, at 4 K they have an RF resistance of an order of magnitude lower than that of Nb, which leads to quality factors above those of Nb. In recent years, there has been an extensive effort converting Nb cavities into Nb₃Sn by alloying the top inner layer of the cavity using Sn diffusion at a high temperature with some degree of success, however, the reproducibility remains a major hindering and limiting factor.

In this study, we report on PVD deposition of NbTiN and NbN inside 6 GHz cavity in an external magnetic coil configuration. The deposition is done at elevated temperature of about 650 °C using Nb₅₃Ti₄₇ target and Nb rod.

We report on the superconducting properties, film structure and its stoichiometry and surface chemical state. The films have been characterised with SEM, XRD, XPS, EDS, SIMS, SQUID magnetometer and direct RF measurement of the cavity.

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Footnotes

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Yes

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