

Enhancement in Quality Factor of SRF Niobium Cavities by Material Diffusion

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Abstract – High quality factor of superconducting radio frequency (SRF) cavities in medium field range (~ 20 MV/m) is desired for future continuous wave accelerator machines to reduce the operating cryogenic loss by reducing the surface resistance. The surface resistance in superconducting materials is the sum of the temperature independent residual resistance and temperature dependent BCS resistance. The surface resistance can be minimized by using several processing technique as well as selectively doping other material in the inner surface of SRF cavities. The increase in quality factor called as Q-rise has been observed in the cavities where titanium was thermally diffused on inner cavity surface. Here, we present the results of recent measurement on the cavity performances where titanium and nitrogen were diffused in SRF niobium.

Keywords (Index Terms) – Quality Factor, Material Diffusion, Niobium, SRF cavities