

PHYSICAL AND MECHANICAL PROPERTIES OF SINGLE AND LARGE CRYSTAL HIGH-RRR NIOBIUM*

Ganapati Rao Myneni, TJNAF

Abstract

High RRR bulk niobium SRF cavities are the building blocks of the latest and future particle accelerators, free electron lasers (FELs) and energy recovery linacs (ERLs). These cavities are fabricated from high purity (RRR) polycrystalline niobium sheets via deep drawing, e-beam welding and surface treatment to obtain high accelerating gradients and quality factors. However, the starting bulk RRR niobium properties are not yet optimized with respect to both cost reduction and achievement of ultimate performance. A major limitation in achieving the highest performance can possibly be attributed to imperfections at or near the grain boundaries. Recently, at Jefferson Lab single/large grain RRR niobium cavities are developed using customized RRR ingots with optimized amounts of impurities such as Tantalum and minimizing the interstitial contents (O, C, N and H). The new cavities are directly made from the sliced discs of the special ingots with large grains and significantly reduced grain boundaries rather than from rolled sheets. This new cavity fabrication process is expected to reduce not only the production cost of the cavities due to less complex processes but also will improve the ultimate cavities' performance due to reduced grain boundaries. In this paper physical and mechanical properties of the single/large grain high RRR niobium will be presented.

*This work was supported by the U.S. Department of Energy Contract No. DE-AC05-84ER40150.

NO SUBMISSION RECIEVED