COMPARISON OF DEFORMATION IN HIGH-PURITY SINGLE/LARGE GRAIN AND POLYCRYSTALLINE NIOBIUM SUPERCONDUCTING CAVITIES*

R.E. Ricker, T.H. Gnaeupel-Herold, M.R. Stoudt, NIST
G.R. Myneni, P. Kneisel, TJNAF

Abstract
The current approach for the fabrication of superconducting radio frequency (SRF) cavities is to roll and deep draw sheets of polycrystalline high-purity niobium. Recently, a new technique was developed at Jefferson Laboratory that enables the fabrication of single-crystal high-purity Nb SRF cavities. To better understand the differences between SRF cavities fabricated out of fine-grained polycrystalline sheet in the standard manner and single crystal cavities fabricated by the new technique, two half-cells were produced according to the two different procedures and compared using a variety of analytical techniques including optical microscopy, scanning laser confocal microscopy, profilometry, and X-ray diffraction. Crystallographic orientations, texture, and residual stresses were determined in the samples before and after forming and this poster presents the results of this ongoing study.

INVESTIGATION OF INGOT MATERIAL WITH LARGE GRAIN FOR RF CAVITIES


Abstract
Metallurgical properties of high purity niobium discs cut from ingot of three companies are investigated. Measurement of the crystal lattice orientation in neighboring grains is done in order to understand high elongation at break and specific behaviour of grain boundaries. The cube orientation is represented in the stereographic projection or as pole figures. The eddy current scanning shows pronounced signal in grain boundary areas. The microstructure of two large crystals connected by EB welding as well as microstructure of chemically treated crystals and grain boundaries is investigated by light microscope and AFM. The deep drawing behaviour and the accuracy of the half cell shape are tested.

*This work was supported by U.S. Department of Energy Contract No. DEAC05-84ER40150