The Beams and Applications Seminar Series

Physical and Mechanical Metallurgy of High Purity Nb for Cavity Fabrication

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Bldg. 401, Room B2100
Friday, July 23, 1:00 PM
Host: Marion White

The process of fabricating a cavity requires many processing steps that alter the physical state, and hence, the functional properties of high purity Nb used for SRF cavities. Recent investigations suggest that the defect state arising from impurities and dislocation substructure may affect high field Q slope and maximum achievable field. To understand the potential sources of defect states that may limit cavity performance (e.g. hot spots), the physical and mechanical history of Nb manipulation used to fabricate a cavity is examined, focusing on processes that introduce or remove impurities and lattice defects: Upon solidification, ingots have large grains with considerable dislocation content, as these grains have orientation gradients of several degrees per mm. Fabrication of parts allows introduction of H and O at the surface, which can be distributed beneath the surface with mechanical working, welding, and heat treatments. Etching, final anneals, and baking cause recovery and recrystallization, which removes or reduces defect and impurity content in specific ways that depend upon the detailed history of deformation and temperature from the time of solidification to final tuning of the cavity.

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