

RRR Degradation and Gas Absorption in the EB Welding Area of High Purity Niobium

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Abstract

Experiences of purity degradation and gas absorption of high purity Nb welded at different electron beam facilities are summarized. The oxygen and nitrogen content as a rule is increased at the welding seam, especially at the overlapping area. The absorption of hydrogen take place not directly at the welding seam but at the thermally affected area. The RRR degradation is moderate, if the total pressure exceeds 5×10^{-5} mbar and the preparation is done under clean conditions. Investigation of artificially produced burning hole has shown, that the content of interstitial impurities in the hole area is dramatically increased (by factor of 5-50). This makes critical a repair of a burning hole in the cavity.

A series of welding was done at the DESY new EB facility, which was specifically designed to meet the requirements on the welding of niobium cavities for TESLA. High vacuum (between 2×10^{-8} and 2×10^{-6} mbar) allowed even improve the niobium purity at the welding seam, the RRR increases from 350 to ca. 370-380. The distributions of RRR, grain size and thermal conductivity in the welding area are discussed.