

Hydrogen Absorption in Electropolishing of Niobium

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Abstract

When hydrogen is absorbed in niobium material, its electrical surface resistance increases, which seriously degrades cavity performance. This phenomenon is often called as hydrogen Q-disease. In mass-production for a superconducting linac such as TESLA, performance reliability of superconducting RF cavities is very important. In the TRISTAN project of KEK, mechanical grinding (buffing) was done on niobium cavities as a pretreatment for electropolishing. As it was believed that hydrogen absorption in niobium occurs during electropolishing process, all the cavities were annealed after the electropolishing for degassing hydrogen in TRISTAN days. For the future cost effective cavity production, it is worth to reconfirm hydrogen absorption in electropolishing. We took electropolishing for a newly made 1300MHz single-cell niobium cavity and removed by 200 mm from the surface. In the cold test hydrogen Q-disease did not occur. To understand this curious result, we did some fundamental experiments on relationships between hydrogen absorption and 1) the varieties of ways to apply electropolishing, 2) mechanical grinding applied and 3) defects caused from mechanical grinding, and so on. We are pursuing further study on surface defects and hydrogen absorption. In this paper, we will report results from these experiments and discuss about the hydrogen Q-disease with electropolishing.