Update on the experiences of electro polishing of multi-cell resonators at DESY

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Abstract

At DESY, electro polishing (EP) is applied on superconducting cavities for about two years now. Acceleration gradients of up to 55 MeV/m have been achieved on nine cell resonators. The EP infrastructure is running continuously since 2004 and serves as a major surface preparation tool now. Data, taken on the cavity panel on line, are available for parameters like current density, removal rate, live time of components and process temperature. We report on the latest data as well as on ongoing studies on material stability and sulphur segregation that was found recently during maintenance of the EP infrastructure.

Field Emission

The main problem of the electro polished cavities seems to be the field emission. After EP the most cavities show a field emission onset between 15 and 20 MeV. There are two principal reasons for field emission: mechanical defects like scratches or holes and chemical impurities at the surface like i.e. dust or impurities inside the niobium surface.

Mechanical Defects

As a result of the change of the control parameter another structure arises for an optimal plant. Actually only the heat exchanger in the minipipe is functional. We are working on a new, more efficient heat exchanger made of pure aluminium. We plan to have an additional heat exchanger in the feeding pipe to stabilize the temperature of the acid more exactly. Another way to stabilize the temperature of the acid before it reaches the cavity is a storage barrel with an integrated heat exchanger. This is not possible for the DESY EP facility because of limited space.

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