

F. Eozénou , S. Berry, Y. Gasser, J-P. Charrier CEA, IRFU, SACM. F-91191 Gif-sur-Yvette, France

Introduction : Electro-Polishing (EP) in HF-H₂SO₄ electrolyte has been efficiently used for the polishing of SRF cavities for decades. However, precise electro-polishing mechanisms involved in this process have only recently been put forward [1,2,3]. In this paper, we will report improved comprehension of the process thanks to the use of a rotating disc electrode. Electrochemical Impedance Spectroscopy measurements have been done on different mixtures. They prove that electro-chemical mechanisms are likely to evolve with the aging of the bath. In particular, an increased diffusion of fluorine could make in possible to fasten the process or to counterbalance the aging of the bath. Precise borders for the parameters should be fixed because a too high fluorine concentration could be the origin of dramatic performances observed on 1-cell cavities.



<u>Conclusion</u>: Voltamperemetric and EIS measurements make it possible to better characterize EP process in HF-H₂SO₄ electrolytes. It is limited by the diffusion of F⁻ ion towards the niobium surface and the surface film is likely to evolve with the aging of the bath, ending in the deterioration of the surface. Moreover, the EIS measurements suggest that this method could be used to evaluate the quality of the electrolyte. However, additional experiments are required to calibrate this possible method. It is conceivable to increase the removal rate during EP by boosting the acid flow rate or adding HF in the electrolyte. More investigation is required to determine adapted borders. In fact, some results on 1-cell cavity correlated with sample studies suggest that a too high fluorine content in bulk niobium could dramatically deteriorate cavity performance.