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Evaluation of the Copper Polishing procedures in the framework of ARIES H2020 Collaboration

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Thin film technology moves the surface preparation from Nb to Cu, because the Nb thin film cannot be chemical treated. For the Nb on Cu resonant cavities two principal copper cleaning and polishing treatments were studied: one is the electropolishing (EP) and the other one is the chemical polishing with SUBU solution. The influence of surface preparation is deeply studied in bulk Nb cavities and it is responsible for the main performances advancement. Similar considerations can be done for Nb on Cu cavities, because the morphology and the roughness of the copper surface are replicated by the Nb growing film. A better understanding of the surface effects and their impact on the thin film and later on RF-properties of the coating is mandatory in order to improve the performances of superconducting (SC) cavities by coating techniques.

A comparison of the 4 principal cleaning and polishing process of Copper was done through the evaluation of the superconductive and morphological properties of Nb thin film coated on Cu planar samples, that are cleaned and polished with different procedures.

The cleaning and polishing procedures were carried out at CERN and at LNL-INFN. The deposition processes were carried out at STFC, University of Siegen and LNL-INFN, using the same procedure and parameters. Different surface characterizations have been applied in order to compare the impact of different substrate preparations on films' SC properties: roughness measurements, SEM, EDS, XRD, AFM, and thermal and photo-stimulated exoelectrons measurements, in 4 different institutions (INFN, Siegen, STFC, RTU). Superconducting properties of Nb films were evaluated with PPMS at Institute of Electrical Engineering of Bratislava.

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