

Application of Plasma Electrolytic Polishing onto SRF Substrates

Authors: E. Chyhyrnyets ✉ eduard.chyhyrnyets@lnl.infn.it
O. Azzolini, R. Caforio, V. Garcia, G. Keppel, F. Stivanello, M. Zanierato, C. Pira



UNIVERSITÀ
DEGLI STUDI
DI PADOVA

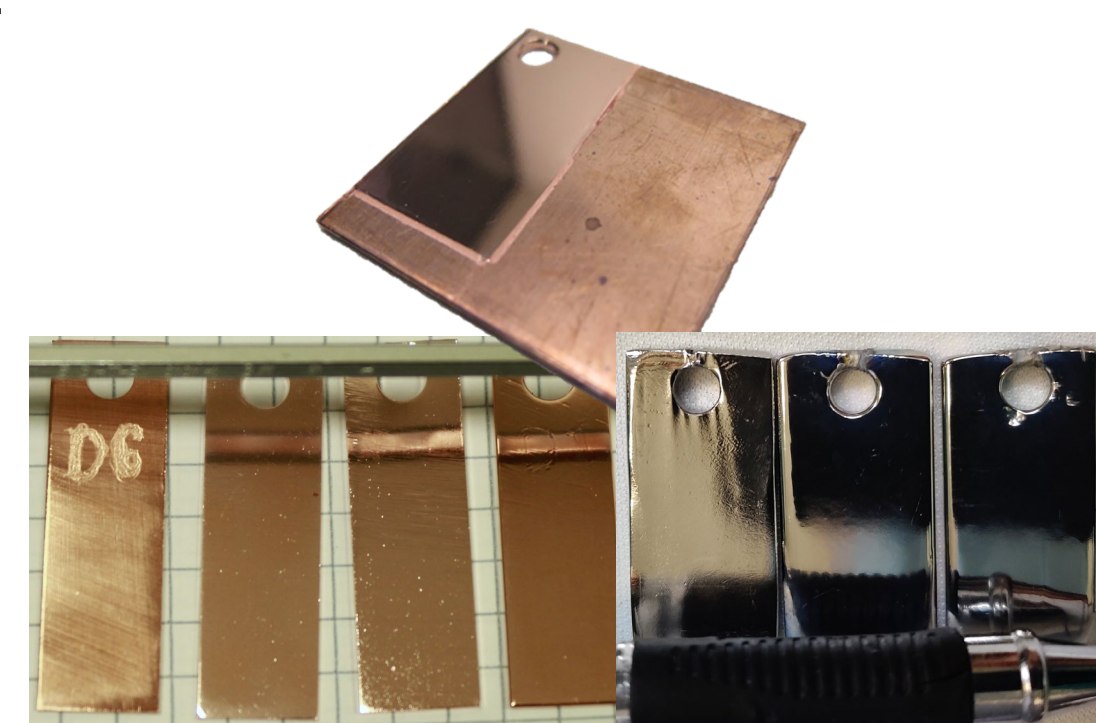


AIM of the work

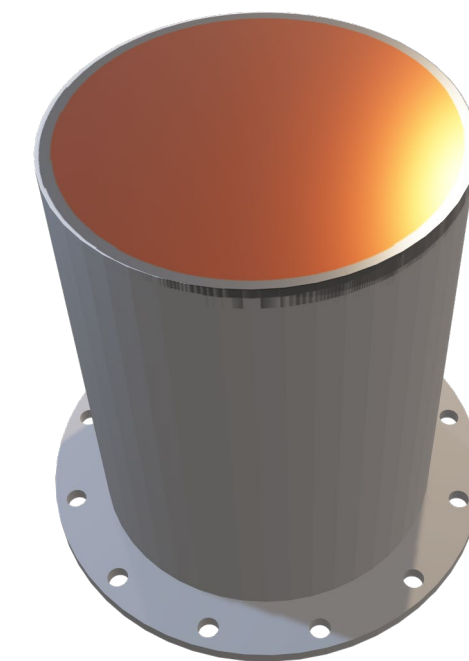
The scope of the work is to show the possibility of PEP application onto SRF substrates.

Work is showing possible system configuration and theirs main challenges.

Scaling from samples to SRF cavities



Samples
~ 10 cm²

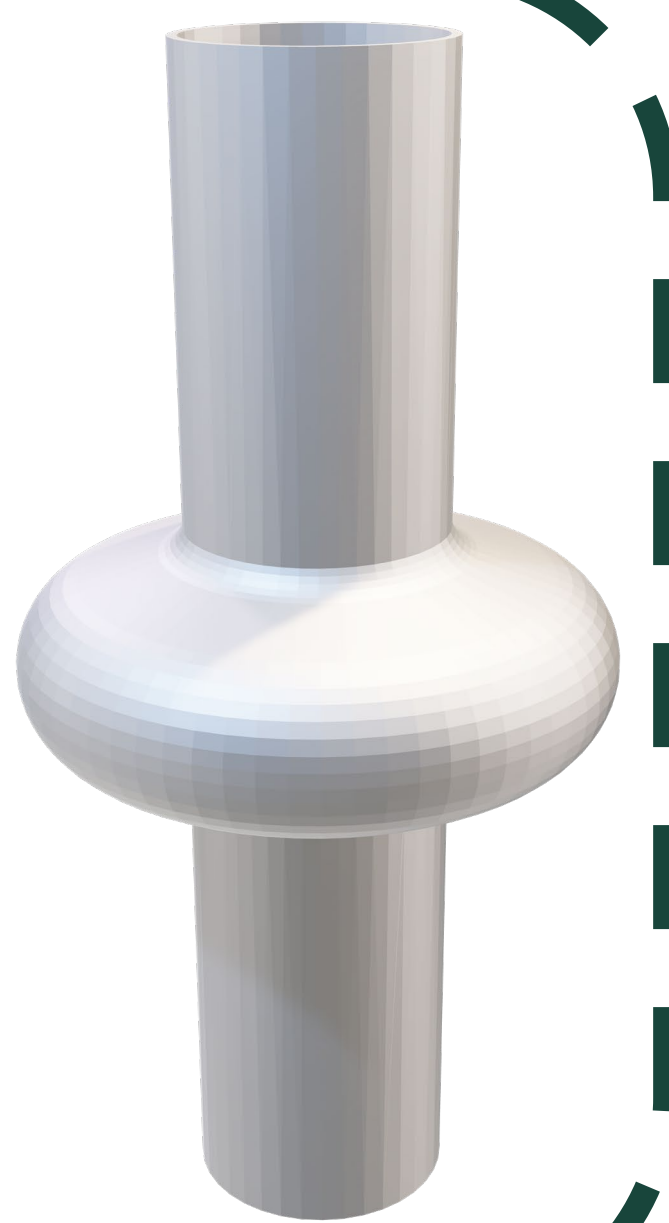


The QPR
samples
~ 50 cm²



6 GHz
~ 92 cm²

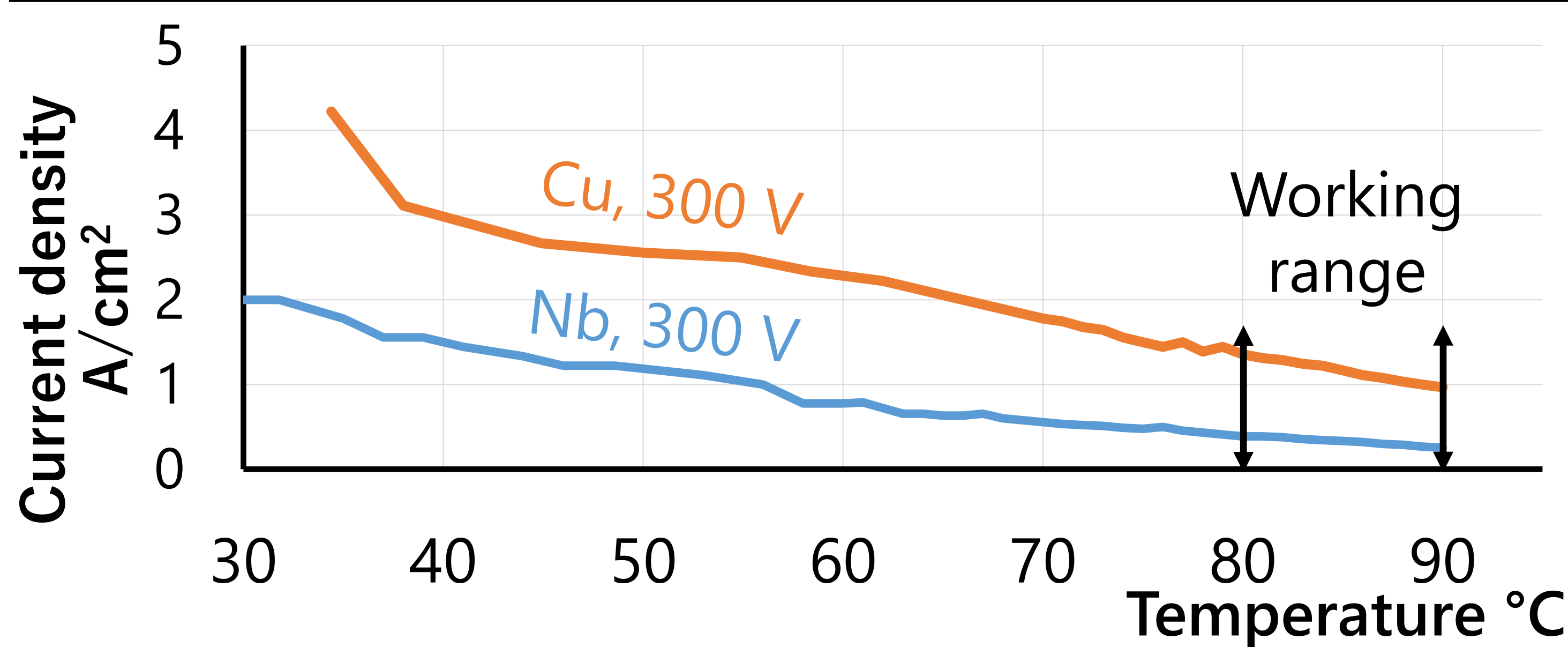
1.3 GHz
~ 1400 cm²



Requirements

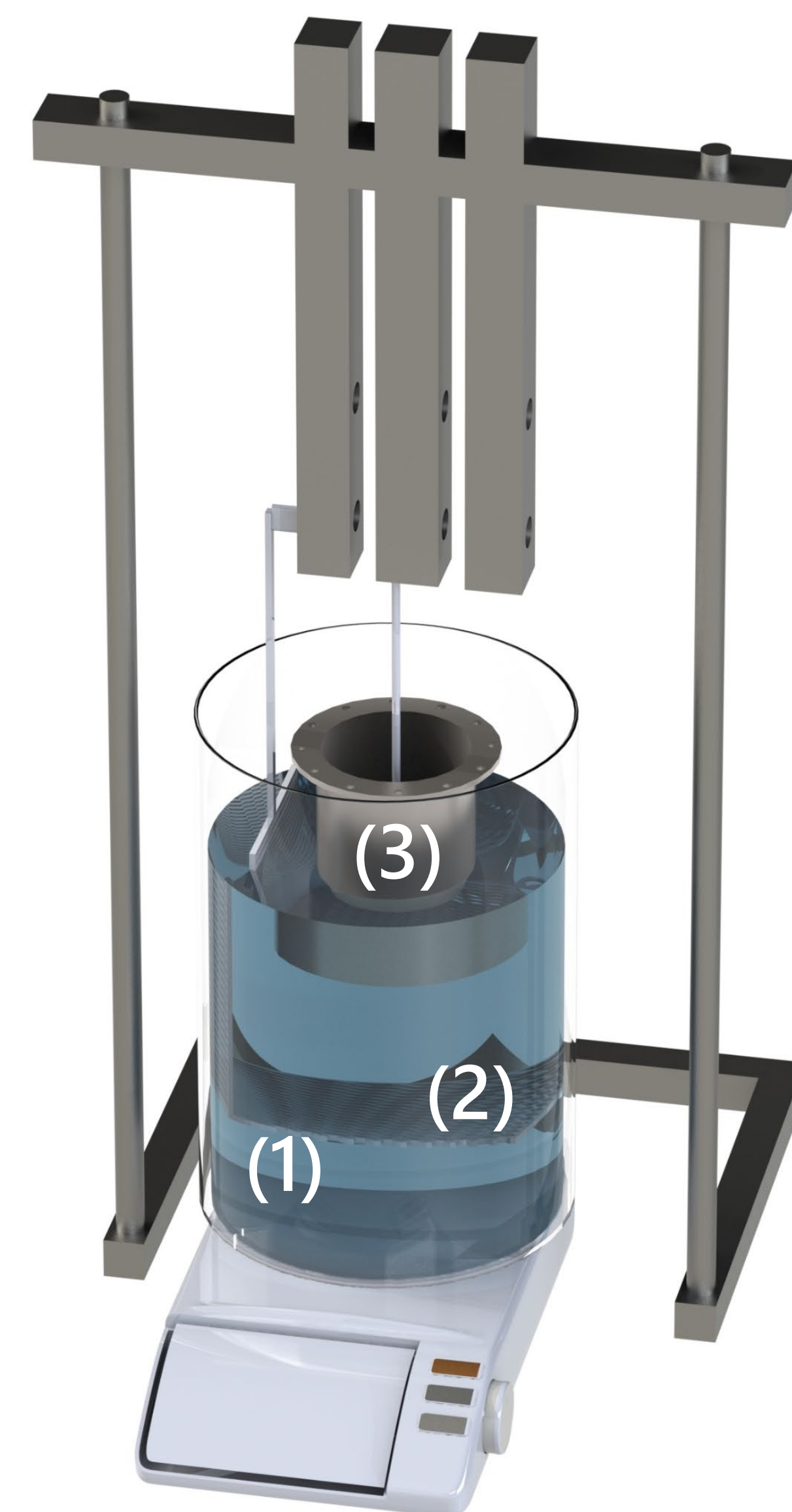
Caption

| | |
|---------------------|---|
| Power delivery | DC Power supply working at >300V 0,4-1,7 A/cm ² |
| Solution cooling | Water coil cooling / N ₂ cooling / jacketed bath |
| Cathode/Anode ratio | High cathode area, double cathode. |
| Working temperature | A range of 70-90 °C |



PEP of QPR sample

Nb/Cu and Nb QPR samples were polished in the water-based diluted salt solution, at 80-90 °C range. Cooling was supported with a N₂ fluxing inside the beaker (1). As a cathode (2) was chosen Ti mesh placed under the workpiece (3 - anode).

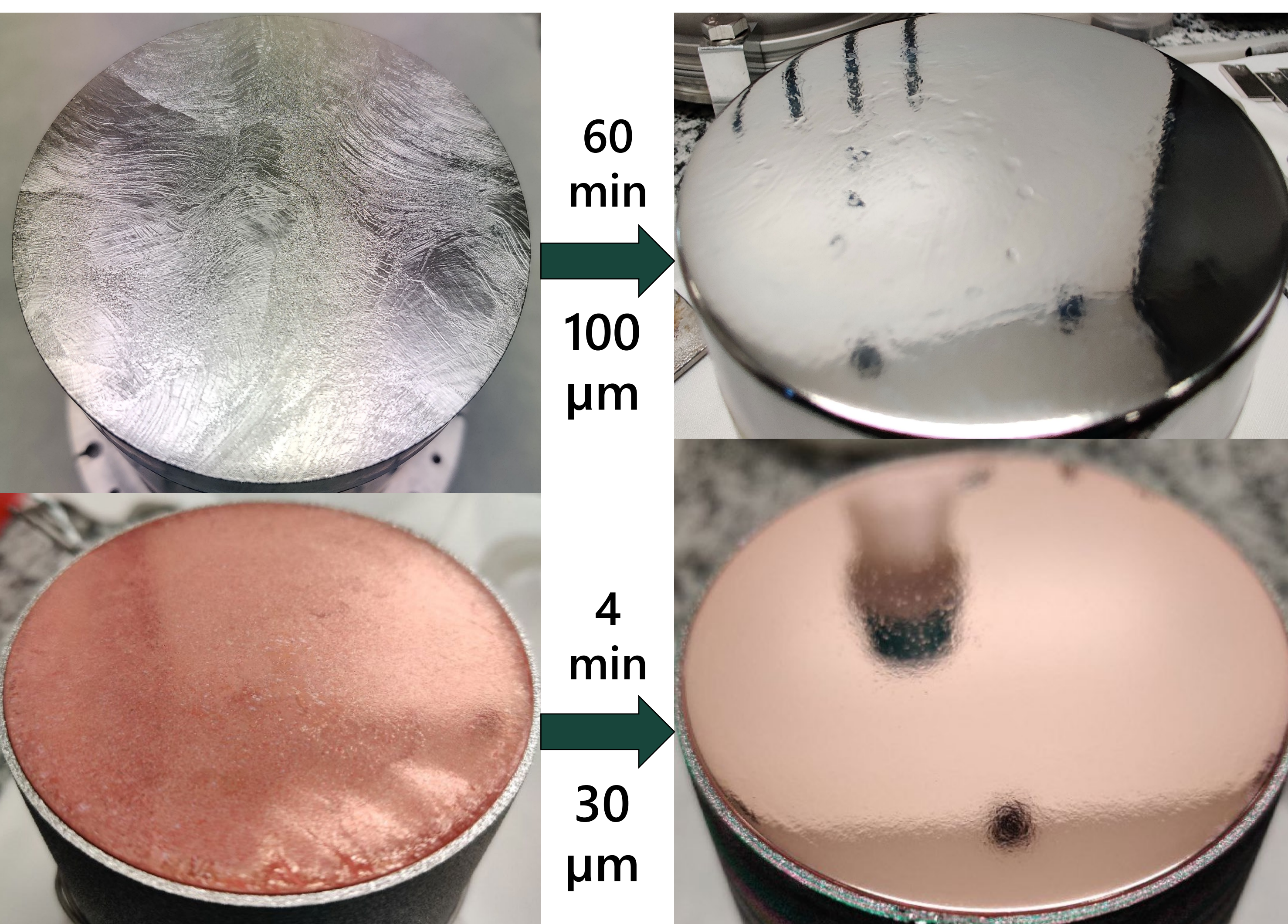


Initial surface of Nb QPR sample presented a pattern after wrong BCP processing. Scratches and peaks had a significant difference in height. Test Cu QPR sample has almost smooth surface, machined by lathe.

Smooth surface obtained in both cases. Nb QPR sample is mirror like reflected with slightly visible pattern. Cu QPR sample present some visible peaks and oxidised Nb border.

Conclusions

In this work it was shown the application of PEP as a preparation tool for SRF needs. Main requirements are described. PEP study should not stop only on phenomenological aspects, since polishing setups play significant role in successful processing.



This project has received funding from the European Union's Horizon 2020 Research and Innovation programme under GA No 101004730.

Work supported by the INFN CSNV experiment TEFEN