

New superconducting radiofrequency materials serving the future FCC collider

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After the luminosity upgrade of the LHC proton collider, it is recognized that the next research machine in particle physics will be a high-energy lepton collider. Among the projects under study such as the ILC, the CLIC and the muon collider, the FCC-ee (Future Circular Collider - electron positrons) appears to be the most attractive option to cover a broad energy spectrum at a high intensity.

The FCC-ee RF system currently includes more than 1,400 cavities, 25% of which are constructed using niobium thin film technology on a copper substrate, a "CERN specialty" since the 1990s which has demonstrated very high reliability in operation with the LEP and the LHC accelerators. The need to push the accelerating gradient and the quality factor of this cavity type to a level never reached before led to new ideas of superconducting materials optimized in the radiofrequency regime. These new approaches include enhanced chemical surface treatments, improved techniques of thin layer deposition and up-to-date assembly methods in ultra-clean environments.

This presentation will present in details all these aspects and will show the recent progress achieved on prototype cavities specially built for the FCC-ee study.