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Surface quality and improvements on the SRF cavity manufacturing by electrohydraulic forming

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In the framework of CERN's Future Circular Collider (FCC), fabrication of high-performance superconducting radiofrequency (SRF) cavities is crucial to attain energy levels relevant for breakthrough research in particle physics. Damage to the inner surface of copper and niobium cavities must be minimized to ensure proper growth of the superconducting film and prevent quenching during operation. An alternative technique to traditional shaping methods, such as deep-drawing and spinning, is electrohydraulic forming (EHF). In EHF, half-cells are formed through high-speed deformation of blanks using shockwaves induced in water by a pulsed electrical discharge. Results on the microstructural properties of formed Cu and Nb half-cells are presented and compared with spun and machined parts. The main reported advantages of EHF are reduced springback, increased shape accuracy, a conservation of the large grain microstructure at the inner surface, and less contamination of the RF surface from the absence of contact with a metallic punch or mandrel. Finally, an update on the fabrication of 6 GHz seamless Cu cavities, one of the objectives of the EASITrain program, is presented.

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