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Influence of Different Narrowing Methods on Critical Current of 1 mm HTS Tapes

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Over the past decade, a great progress has been achieved in terms of performances of high temperature superconducting (HTS) tapes, such as the critical current of the tape with 4 mm width exceeds 200 A. Due to the high critical current, the narrowing process to 1 mm width for the HTS tape became a feasible technology, and the value of critical current for the 1 mm tape is able to above 50 A. The 1 mm width tape is firstly suggested by our group in 2016, and a soldered-stacked-square (3S) wire is also fabricated based on the 1 mm tape. However, during the narrowing process, some loss of critical current was observed in many experiments. This significantly affects the stable fabrication of the 3S wire. To understand the influence of narrowing process on critical current, we proposed two narrowing methods to manufacture the 1 mm tapes, mechanical cutting and laser cutting methods in this paper. Meanwhile, the soldering tin plating process is also considered in the manufacturing process of 1 mm tape. The critical current measurements were carried out in order to make a comparison with these two methods. The detailed results about the critical current measurement experiment, the microscope observation experiment, and the soldering tin plating process are presented and discussed in this study.