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Air-gap Observation in Joints of REBCO Tapes by Use of X-ray Computed Tomography

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R&D on joints between superconducting wires or tapes is one of the most important issues for the development of large-scale superconducting applications such as magnet, rotation machine and so on. Although the electro-magnetic properties between superconducting joints have been evaluated in several ways, the interfacial structure of the joint should also be investigated in order to sufficient understand the state of the joints. In this study, we have investigated the air-gap between the joints of REBCO tapes by using a non-destructive method, X-ray Computed Tomography (CT). The superconducting joint was prepared by a method using additionally deposited precursor layer and the *R-T* transition could be obtained. However, air-gap between two REBCO tapes was also confirmed by X-ray CT. Therefore, we have binarized the CT images for three-dimensional air-gap analysis. For the binarization, we have adopted an advanced binarizing method, "locally adaptive binarization processing" because the CT images were affected by artifacts such as metal artifact and beam hardening. After the process, three-dimensional model of the air-gap was successfully constructed. As the results, wide air-gap across the tape width was confirmed from the edge of the joint to the depth of 610 micrometer. In addition, one-side edge had longitudinal air-gap of the thickness of 44 micrometer. These results are significant for the estimation of the joint including the electrical and mechanical properties.

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