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# Influence of bolt positions and electrode structure in Yoroi-coil structure on stress distribution in an HTS coil winding

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Large hoop stress causes the deterioration of the transport properties of the winding. Therefore, high electromagnetic force tolerance is required for structure of the winding, and at the same time, it is necessary to limit the current density so as not to deteriorate the superconducting characteristic. As this countermeasure, a high strength pancake coil structure called “Yoroi-coil” (Y-based oxide superconductor and reinforcing outer integrated coil) is suggested. Yoroi-coil structure is expected to reduce the electromagnetic force applied to the winding and the volume of the coil frame at the outside of the winding. In previous studies, it has been reported the effect of hoop stress reduction in ideal “Yoroi-coil” structure without bolts and an electrode. However, in the practical “Yoroi-coil structure, there are some bolts for fixing a frame and reinforcing outer plates, and the frame shape is not cylindrical but C-shaped because there are electrodes. Therefore, in order to clarify the effect of the hoop stress reduction by the practical “Yoroi-coil” structure, it is necessary to investigate the influence of the actual frame shape and bolts on the stress distribution in an HTS coil winding. In this study, the effect of the stress reduction of an HTS coil winding by the practical “Yoroi-coil” structure considering bolts, an electrode, and a bobbin was examined by three-dimensional finite element method. Numerical results show that stress distribution is generated in the winding according to the bolt position and it is necessary to increase the number of bolts to suppress stress distribution in the winding. Local large stress is also applied to the winding around the electrode. In order not to apply the local stress to the winding, the mechanical strength of the electrode is very important. Based on these results, design guidelines for the practical “Yoroi-coil” structure is clarified.

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