

Jointing Performance in HTc SC Tape for remountable magnet system

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A concept of the remountable superconducting magnet using HTc SC tapes has been proposed for the future design of the fusion power plant [1] to reduce both costs of the construction and the maintenance. The HTc superconductors are used in this concept because their robustness against a heat generation at the jointing parts allows a direct jointing of the magnet. The butt jointing method of HTc superconducting magnet [2] and investigations on the butt jointing of Bi-2223 HTc superconducting tapes have been performed [1,3]. In the previous study [1], dependence of the jointing resistance on the transport current was observed in the experiment that a single layered HTc superconducting tape is jointed with another one.

In this study, therefore, a numerical analysis was performed to investigate the reason this dependence of jointing resistance occurs in the experiment.

And secondly, the experiment to show the performance of butt jointing for a cable was performed by using the cable laminating ten superconducting tapes. The contact surface of laminated superconducting cable was cut down by angle of 45 degree inclined from the tapes.

Through this study, we obtained the following results;

1. From the numerical analysis where the decrease of the critical current density near the contact surface is assumed, the results of the jointing resistance in case of 0.4 mm had good agreements with the previous experimental results.
2. The case of 0.4 mm notched surface was unrealistic because it was much larger than the actual shape of the contact surface, so that there are possibilities that the 0.4 mm was a scale of the degraded filament.
3. The relationship between compressive stress and the critical current of the laminated cable was confirmed. And it can be predicted that there happened the degradation in the superconducting filaments by increasing the contact stress.
4. The optimum stress, which gives the minimum jointing resistance, therefore, exists due to tradeoff between the reduction of jointing resistance and degradation of SC performance in the filaments.
5. The optimum stress obtained by the experiment was lower than the predicted value through other experiments. The reason will be clarified in the full paper.

[1] H. Hashizume, S. Ito, K. Yagi and S. Kitajima, *Fusion Eng. and Des.*, 63-64, 449 (2002)

[2] S. Ito, H. Hashizume and K. Kitajima, *J. Applied Electromagnetics and Mech.*, 14, 85 (2001)

[3] S. Ito, H. Hashizume and T. Yamauchi, *J. Applied Electromagnetics and Mech.*, to be published