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Superconducting Joint for "Reacted"MgB2 multifilament Wires for the Development of MRI Magnets

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In recent years, magnesium diboride (MgB2) wire has become a promising candidate for the development of superconducting magnetic resonance imaging (MRI) magnets because of its critical temperature (39 K), which allows magnets to be operated without using liquid helium. Extensive research using unreacted MgB2 wire has enabled MgB2 MRI magnets to be operated in persistent current mode (PCM). We previously demonstrated the strong possibility of using the superconducting joint technique for developing MgB2 MRI magnets. However, MgB2 joints that have already reacted and are subsequently damaged by quenching are impossible to reproduce with the unreacted joint technique. In this study, we developed a superconducting joint technique for "reacted"MgB2 multifilament wires fabricated by a powder processing method using Mg and B powder (in situ) and reacted MgB2 powder (ex situ). A customized laboratory-built induction furnace was used to locally heat the jointed area to prevent the non-jointed region from becoming overheated. The superconducting properties of the joint such as the critical current and close loop test were evaluated. Moreover, the SEM images and EDS results were analyzed to determine the temperature and duration of heat treatment.

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