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Fabrication and Properties of In-situ Processed MgB_2/Fe Conductors

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MgB_2 conductors are fabricated by powder-in-tube (PIT) methods. Here we report the recent progress of our PIT-processed MgB_2 conductors in Institute for Superconducting and Electronic Materials (ISEM), Australia and Hyper Tech Research Inc., USA. The superconducting properties of the MgB_2 conductors are sensitive to the quality of the starting materials, sintering conditions, and carbon (C) compound additions. In the case of the *in-situ* method, some kinds of C compound additions to the starting powder introduce a C substitution for boron sites in MgB_2 structure and enhance superconductivities. Specifically, B_{irr} reached 10 T at 20K, a value which is nearly similar to that of commercial Nb-Ti low temperature superconductor at 4.2 K. This result suggests that MgB_2 conductors are promising as conductors of cryogen-free magnets. Recently, we succeeded in the fabrication of high performance MgB_2/Fe conductors using a carbohydrate such as $C_4H_6O_5$. The highest J_c values reached 10,000 Acm^{-2} at 4.2 K and 10 T even low sintering temperature of 600°C. However, these J_c values are still below a practical application level. We need further to improve the MgB_2 conductor for applications.

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