

The Development of Brazing Filler for ITER Cooling Pipe

Attachment

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Abstract

ITER is the most important nuclear fusion facility toward the future fusion reactor. Most of the components suffer very harsh environment, such as low & high temperature, various large stresses (forces), neutron irradiation, etc. Magnet supports is one of these components to sustain all the superconductor magnet coils, these system operate at several K to several ten K low temperature. Various cooling pipe is needed for maintaining the low temperature. It is suggested to use brazing connection to attach the cooling pipe to support plates. Hence, brazing filler with good strength, toughness and thermal conduction is required. In this study, we developed several kinds brazing filler as candidates, including Sn-Pb, Ag- based and Cu-based alloy. The composition, microstructure, wet-angle, boundary condition after brazing, brazing strength at both room temperature and low temperature, and toughness were tested. It was found that, Sn-Pb based filler has very good wettability with 316LN matrix material, good toughness, but the strength is not promising. Cu-based filler shows good strength, toughness and bonding with matrix material, however, the high brazing temperature, which may degrade the matrix material should be noted. Ag-based filler shows good strength, toughness and reasonable wettability with matrix material, but high cost. Detail of the research result will be presented and discussed in this report.