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Recent progress in development of high performance CICCs for CFETR magnet

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The CFETR, "China Fusion Engineering Test Reactor", is a new tokamak device. Its magnet system includes the Toroidal Field (TF), Central Solenoid (CS) and Poloidal Field (PF) coils. The main goal of this project is to build a fusion engineering tokamak reactor with fusion power of 50-200 MW and self-sufficiency by blanket. The maximum field of CS and TF will get around 15 T, which is much higher than that of other reactors. Tremendous investigations have been made in the development of high performance CICCs for CFETR magnet in the last two years. High temperature superconductors and new designs for CICCs were considered. Firstly, one CICC referred to ITER CS was developed for CFETR Central Solenoid Model Coil (CSMC), and tested at SFC in 2016, showing similar behavior as ITER CS with good performance. Furthermore, two small-size Bi2212 conductors with 42 wires were developed, heat treated at 1 and 50atm, separately. As the result, the one heat-treated under 50 atm shows higher Ic by a factor of 2. Based on the investigations, Bi2212 prohibits big potential to develop the full size CICC for CFETR CS and TF magnet. Moreover, one CICC with new design was proposed, manufactured and tested. This new CICC presents with higher stiffness but less strand damage inside as advantages, after the test at Twente University for stiffness (77 K) and AC loss. The stiffness shows similar behavior to ITER CS conductors. In this paper, the recent progress in development of high performance CICCs for CFETR magnet are introduced and described in details, in terms of manufacture, test results, and their analysis.

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