



Contribution ID: 28

Type: **Invited Oral**

Sat-Af-Spe1-07: [Invited] Plans and progresses on HTS CICC for fusion in China

Saturday 5 July 2025 15:30 (15 minutes)

As the high critical current at high field, the representative second-generation high-temperature superconductor (2G HTS) ReBCO serves as a good candidate for future fusion devices, i.e. the Chinese fusion engineering test reactor (CFETR), the Demonstration Power Station (DEMO) with magnet field higher than 15T. The main goal of CFETR is to build a fusion engineering tokamak reactor with a fusion power of 50–200 MW, and test the breeding tritium during the fusion reaction. This requires the central solenoid and toroidal field coils with a maximum magnetic field exceeding 15T.

A 80 kA class Cable-in-Conduit-Conductor (CICC) under 15 T is targeted in the CFETR project. ReBCO is considered as a potential and promising superconductor. R&D activities are ongoing at the Institute of Plasma Physics, Chinese Academy of Sciences for demonstrating of a CICC based on ReBCO tape manufactured by Shanghai Superconductor. One sub-size conductor cabled with more than 45 tapes and then a coil wound with this conductor reaching peak field of 20T under background field were designed, manufactured and tested. In this paper, the transport properties, dependence on the strain of the ReBCO tape, as well as the performance of the sub-size conductor and the insert coil are investigated and reported. The results exhibit the feasibility of ReBCO CICC for Fusion magnet delivering high field.

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Session Classification: Sat-Af-Spe1 - [Special Session] High Current HTS Cables for Fusion and Beyond