MT26 Abstracts, Timetable and Presentations



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Mon-Mo-Po1.05-04 [57]: The application of TSTC based on ReBCO tapes in CFETR CS magnet design

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In order to further study fusion, China National Integration Design Group designed and developed a new superconducting magnet tokamak device, China Fusion Engineering Test Reactor (CFETR). As one of the most important components of the CFETR, the CS coil will be constructed to create, form and maintain a stable operation of the plasma. The latest CFETR CS magnet system design requirements are as follows:

1) To produce a 12-T peak field in the core of the magnet.

2) The maximum magnetic field on the NbTi module is lower than 6 T.

3) The maximum magnetic field change rate is 1.5 T/s, and the operating current is 47.65 kA.

4) The unit length of one Nb3Sn conductor is shorter than 1 km.

These requirements will bring a series of problems and challenges such as stability margin and mechanical safety to the design work of CS magnets. In recent years, with the development of HTS wires (especially ReBCO tapes), HTS has become an important choice for designing CS magnets in the future. Among the HTS wires, only Bi2212, Bi2223 and ReBCO are considered suitable for large-scale applications. Compared to the former two, ReBCO tapes not only has higher current transfer capability, but also No complicated heat treatment process is required after the strip is wound. Therefore, ReBCO will be one of the important alternatives for the design of CS magnet for fusion device in the future.

In this paper, we first calculate the equivalent material properties of the TSTC based on ReBCO. Then, according to the latest CFETR CS magnet design requirements, a hybrid CS magnet model based on ReBCO, Nb3Sn and NbTi was designed and analyzed. The results will provide reference for the design of high field strength and large current magnets in future fusion devices.

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