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## The Study on Excitation Loss of NI Coil for TF Magnets

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Tokamak is a feasible device to keep the fusion reaction by magnetic confinement method. The high DC current is loaded on toroidal field (TF) magnets to generate high field for plasma confinement. However, this load may also bring heat loss for normal conductor and the risk of melting. High temperature superconductor has great potential for TF magnets due to its zero resistance and high current density under high field. No-insulation (NI) coil without turn-to-turn insulation allows current flowing thorough turns, which leads to excellent electromagnetic and thermal stability. In this article, we present a scheme of HTS NI coil for TF magnets manufacturing. The tension controlling[1] method is used during winding process for better performance. Then, a charging test is carried out with TF magnets immersed by liquid nitrogen (LN<sub>2</sub>). The calorimetric method is selected to measure the excitation loss by the boil-off rate of LN<sub>2</sub>[2]. After that, a 3D finite element model with rotated anisotropic resistivity[3] is established to analysis charging process. Both excitation loss and charging time will be discussed. The conclusion of this article will help the design and optimization of cryogenic system.

Key words: TF magnets, No-insulation Coil, Calorimetric method, Excitation loss, finite element model.

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