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Electromagnetic Characteristics of a Bitter-like HTS Magnet Excited by Flux Pump with Thermal Switch

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With commercialization of high temperature superconducting (HTS) RE (RE= rare earth) Ba-Cu-O tapes, it is extensively applied in the superconducting magnets with high magnetic field due to its high critical current density and excellent mechanical properties compared to low temperature superconducting (LTS) conductors. However, it is difficult to realize the persistent current mode (PCM) because of the immature superconducting soldering technique comparing with the conventional LTS magnet. Bitter-like HTS magnet stacked by annular REBCO plates and magnetized by flux pump or field-cooling is a promising to overcome such drawbacks without joint resistance. This paper firstly presents. This paper firstly takes the anisotropic characteristics into account to present the electromagnetic characteristics of a Bitter-like HTS magnet simulated by COMSOL software. After a mini-model Bitter-like HTS magnet is designed and fabricated by stacking annular HTS plates made from wide REBCO tapes, experiment on its electromagnetic characteristics is performed in 4.2 K with thermal switch excited by flux pump in order to validate the simulated results. Results show that Bitter-like magnet can be excited by flux pump with thermal switch, and HTS magnet stacked by many annular plates can operate in PCM without current leads and avoid soldering bottleneck without resistance comparing to conventional HTS magnet operation.

Index Terms: Bitter-like HTS magnet, electromagnetic characteristics, persistent current mode, REBCO annular plates, thermal switch.

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