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Mon-Af-Po1.19-09 [73]: Contactless Magnetizing Technology Based on YBCO High Temperature Superconducting Tape

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Recent progress in material science has proved that high temperature superconductors have a great potential to trap significant magnetic flux due to the characteristics of flux pinning, which makes them particularly attractive for a variety of engineering applications. However, using traditional methods to magnetise a superconductor, the applied field needs to be at least as high as the expected magnetic field, which needs high current power supply equipment and leads to a huge expenditure. This research focuses on a Thermally Actuated Flux Pumping Method (TAFPM) which is a novel technique to magnetise the superconductor which only requires a magnetic field with strength as low as that of permanent magnets and theoretically a flux density of more than 20 T can be obtained. Finally, with this thermally actuated magnetisation flux pumping technique, we can make lighter, more efficient and cheaper superconducting power devices, which will make a big contribution to the technical innovation of a variety of engineering applications, ranging from public transportation, through medical equipment, to high energy physics.
Based on the YBCO high temperature superconducting bulk, This research uses the Thermally Actuated Flux Pumping Method to generate a travelling magnetic wave in order to magnetise the superconductor, by measuring the trapped field and AC loss in the high temperature superconducting, optimising the Thermomagnetic Material (TM) and the travelling magnetic wave, finally making the Thermally Actuated Flux Pumping system more efficient and stable. Based on the critical state model, this research also analyses the critical current density JC and flux pinning force FP, investigating the micromechanism of the flux creep effect for 2G high temperature superconductors, revealing the physics underlying the flux pumping effect based on the travelling magnetic wave, finally providing the theoretical support and technical assurance to realise the steady strong magnetic field for high temperature superconductors.

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