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ADVANCED MATERIALS RESEARCH & INNOVATION

Fresh Insights for Hybrid High Temperature Superconducting Trapped Field Magnets

Access to the Royce Wide Bore Magnet allowed researchers from the University of Strathclyde to publish results that are poised to inspire new paradigms in the design of trapped field magnets, especially those utilizing coated superconducting materials.

Wide Bore Magnet

The wide bore magnet is a 12 T solenoid fitted with a VTI with a 100 mm usable bore supplied by Oxford Innovative Cryogenic Engineering. Temperature control is possible from 325 K to <2 K.

This system is intended to facilitate materials characterisation and process development across a wide range of topics within the theme of Materials for Energy-Efficient ICT. This system is ideal for facilitating developments in processing of mesoscopally ordered materials, superconductors and low loss high permeability materials. While the system is provided with a generic fixed sample probe and a 100 A transport probe, technical support will be available to exploit the large internal bore of this magnet by designing custom measurement probes.

ROYCE

CHALLENGE

High Temperature Superconductors (HTS) have great potential for applications as quasi permanent magnets. However, traditional HTS materials such as bulks and stacks are limited in both mechanical strength and size. The team from the University of Strathclyde have been investigating the potential of HTS-stacked ring magnets, which are quick and easy to produce. The trapped field characteristics were investigated utilising the 12 Tesla magnet hosted by Royce at the University of Cambridge.

RESULTS

"We focused on the unique magnetization characteristics of HTS-stacked ring magnets that can achieve a trapped field higher than the applied field. We investigated the reasons leading to the field ascent during magnetization and a finally trapped field higher than the applied field by normal field cooling process. We also found that the HTS stack inserts can suppress the rise of the magnetic field and studied this phenomenon." Prof Min Zhanh, University of Strathclyde

"The research offers fresh insights into the study of trapped fields based on HTS materials, particularly in attaining superior trapped fields with a reduced applied field."

The results were published in the Journal of Applied Physics, Magnetization mechanism of a hybrid high temperature superconducting trapped field magnet. "This is, to my knowledge, a unique facility where users can access large stable magnetic field at cryogenic temperatures for a broad range of characterisation experiments. It supports those groups that do not have the inhouse capability or knowhow and so advances the range of characterisation facilities greatly." Anthony Dennis, Facility Manager.

Visit **royce.ac.uk/impact** to read more impact case studies from the Henry Royce Institute

Contact royce@maxwell.cam.ac.uk to use Royce Cambridge equipment

"Anthony Dennis, Technical Lead of the Royce Wide-Bore Magnet demonstrated exceptional expertise throughout the duration of the project. His professional and efficient assistance significantly contributed to the smooth progression of our research. Thanks to his invaluable help, all aspects of the project proceeded seamlessly, and the equipment functioned flawlessly, fulfilling all necessary requirements."

Prof. Min Zhang
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