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Influence of ferromagnetic structure addition on the field trapping ability of MgB₂ bulk samples

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Superconductors have revolutionized magnet technology, surpassing the limitations of traditional coils and permanent magnets. Relying on the results of trapped field measurements carried out on MgB₂ discs, in this paper we numerically investigate the field trapping ability of hybrid layouts where ferromagnetic (FM) structures were added to a superconducting (SC) disc. To this aim, through an iterative procedure we first evaluated the critical current density dependence on magnetic flux density that allows reproducing the trapped field measured in the superconductor. Then, this dependence was entered into a numerical model based on the magnetic vector potential A-formulation and employed to calculate the field trapped in different hybrid layouts. The best results were achieved assuming a drilled SC disc filled with a FM bulk disc. The effect of the radius of the FM disc on the field trapping capability of the whole structure was finally investigated.

Topic

Innovative methods and tools for modelling large-scale HTS systems

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