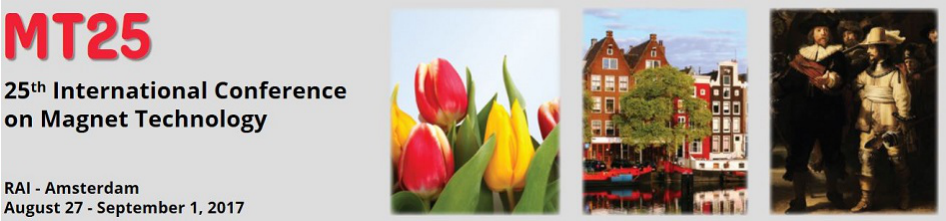

Contribution ID: **520** Type: **Poster Presentation of 1h45m**

Hysteresis modeling of MgB2 using simplified Jiles-Atheron model

Wednesday, 30 August 2017 13:15 (1h 45m)

The continuous advancement of superconductors has empowered numerous industrious, power system, and military utilizations. The performances of MgB2 expand the utilization of superconductors through power transmission, power generation, transportation vehicle, propulsion vessel and several other applications. The proposed higher-level model provides a computationally-efficient tool capable of predicting the hysteretic magnetization of MgB2. It is well-known that Jiles-Atheron model is probably the most important hysteresis model in the literature and has been used extensively as a fundamental tool for modeling and interpreting several complex magnetizing processes in magnetic materials. Phenomenologically, the superconducting hysteresis is analogy to that of ferro-magnetic hysteresis although their physical mechanisms are different. However, Jiles-Atheron modeling of superconducting hysteresis has not proven popular. Mayergoyz showed that the Bean critical-state model is a particular case of the Preisach model and concluded that, perhaps, it is more accurate to use it to describe superconducting hysteresis than ferromagnetic hysteresis. Follow-up work3 showed that in addition to a slight modification to the classical Preisach formulation, a set of first-order reversal curves is required which was predicted to emerge as the standard technique for characterizing hard superconducting hysteresis. Although promising, Preisach modeling of superconducting hysteresis has not proven popular. This might be because it provides little-to-no physical insight into the processes of interest or because it requires extensive experimental data. In this paper, a simplified Jiles-Atheron model is presented via combination of the bean critical current model and Jiles-Atheron mathematical model. The model macroscopically consists of the hysteretic (irreversible) and non-hysteretic (reversible) fluxoid pinning and motion. The calculated results from the proposed model are compared with the experimental data, and comparison results show that the proposed model is capable of simulating various shapes of hysteresis loops of MgB2.

Submitters Country

china

Primary author: Mr DONG, Kun (the Ohio state university)

Presenter: Mr DONG, Kun (the Ohio state university)

Session Classification: Wed-Af-Po3.09

Track Classification: F3 - MgB2 and Iron-based Wires and Cables