Numerical Characterization Method for Magnetic Materials with Vector Hysteresis

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Abstract. The paper presents a numerical method based on Preisach model for the characterization and modelling of hysteretic magnetic materials exhibiting vector hysteresis, with acceptable accuracy, based on minimal material measurement data. Unlike the scheme proposed by Ragusa and Repetto, the one presented here uses the Everett distribution function instead of the Preisach distribution function. The identification approach based on the Everett distribution function is a way to obtain accurate numerical solutions when the experimental data of the magnetic material are scarce, for instance: there are known only the initial magnetization curve and the upward major branch for two directions (rolling and transverse ones). The comparison between the measured and simulated major loop curves for other magnetization directions shows good agreements.

1 Introduction

In recent years a renewed interest is observed in the scientific community for the study of materials showing the property of hysteresis which is closely related to a more common application: the process of recording (usually magnetic recording) and the property of memory.

2 Method of modelling of vector hysteretic magnetic materials

In this paper, the Mayergoyz's Fourier angular expansion technique [1] is employed to characterize magnetic materials with vector hysteresis. The adopted model is combined with an identification procedure on analytical basis of Fourier coefficients into special grid of Preisach triangle [2]. Because the experimental data of the magnetic material can be scarce, for instance: there are known only the initial magnetization curve and the upward major branch for two directions (rolling and transverse ones), the Everett distribution function [3] is used instead of the Preisach distribution function, in order to reduce the strong ill-posed of the identification process.

In the full paper we will provide more details about proposed methodology for modeling and identification of vector hysteresis using Preisach model, and numerical results obtained using experimental data.

References

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[3] R. M. Del Vecchio: "An efficient procedure for modeling complex hysteresis processes in ferromagnetic materials", *IEEE Trans. Magn.*, vol. 16, no. 5, pp. 809-811, 1980.