

PREISACH IMAGES OF A SIMPLE MECHANICAL SYSTEM

M.W. Gutowski^a, Amy Chyao^b, and S. Markovskiy^a

^aInstitute of Physics, Polish Academy of Sciences, Warszawa, Poland

^bstudent, Plano East Senior High School, Plano, Texas, USA

This work is an early stage of a larger project aiming at answering the question whether or not the Preisach map is really fingerprinting magnetic materials. More precisely, we are interested if Preisach model of magnetic hysteresis indeed contains any physics or is just a convenient modeling tool. To this extent we present a very simple mechanical system, thus fully tractable, subjected to the influence of an external force. Despite its simplicity, our model simulates nicely all the fundamental features of real magnetic materials, namely their hysteretic behavior, coercivity, remanent magnetization and saturation at high fields. Both the overall shape of major hysteresis loop as well as First Order Reversal Curves (FORC's) are reproduced quite correctly; they are very similar to those observed in modern hard magnetic materials. It is also possible to simulate convincingly the shape of hysteresis loops for soft (nanocrystalline or amorphous) materials but not their FORC's. The model essentially consists of a single, spring loaded, rigid and rotative bar with non-zero friction torque. The length of a projection of this bar onto the direction of an external force is identified with magnetization. The friction torque and the spring constant are the only freely adjustable parameters of our model. Here we investigate, and present, their influence on the inferred Preisach maps. Further work, including single and two interacting Stoner-Wohlfarth's particles, is in progress.

9.7 cm

13.4 cm

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Corresponding author :

M.W. Gutowski

Address for correspondence :

Instytut Fizyki PAN

Al. Lotników 32/46

02-668 Warszawa

Poland

Email address :

marek.gutowski@ifpan.edu.pl