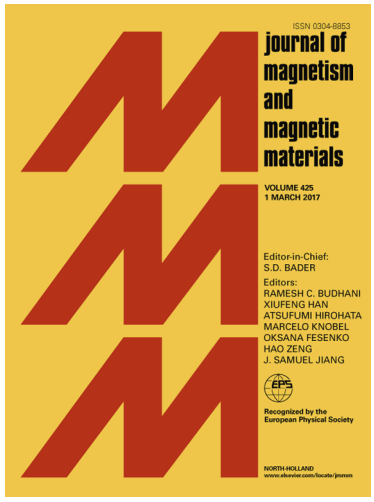

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TEMPERATURE BLOCKING AND MAGNETIZATION OF MAGNETOACTIVE ELASTOMERS

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The magnetization of a magnetoactive elastomer (MAE) with microparticles of soft magnetic carbonyl iron embedded in a highly elastic matrix has been studied. It is shown that at high temperatures its magnetization curve has the form of a specific hysteresis loop. This hysteresis is attributed to the influence of displacement of magnetized particles in the elastically soft elastomer matrix under the effect of magnetic forces, leading to the change of magnetic interaction between the particles. In this case, there is a maximum in the field dependence of the magnetic susceptibility, the occurrence of which has been associated with the competition between re-arrangement of particles, when they are displaced in a magnetic field, and saturation of particles' magnetization. When the MAE is cooled below approximately 225 K, both the magnetic hysteresis and the maximum in the field dependence of the magnetic susceptibility disappear. When the MAE material is cooled below the solidification temperature of the elastomer matrix, the displacements of the magnetic particles during magnetization are blocked by the rigid matrix. The magnetization reversal of the MAE is reversible. This means that the shape of subsequent magnetization loops remains constant and the sample returns into the initial non-magnetized state after the magnetic field is turned off.

1. Introduction

The magnetoactive elastomers (MAE) are composites with a pronounced magnetorheological effect, in which magnetic particles are able to move in the matrix under the action of magnetic forces when they are magnetized by a magnetic field [1-4]. In the MAE, an anomalously large magnetostriction with a relative elongation of up to 100% [5,6], an anomalous increase in the elastic moduli [7-9], and a significant increase