DOMAIN WALL CREEP RATE UNDER THE ACTION OF UNIPOLAR MAGNETIC FIELD ALONG THE AXIS OF HARD MAGNETIZATION

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The study of behaviour of the domain wall creep rate in the unipolar field yields valuable information about the theory of creep as well as about practical applications.

The samples were prepared in the way described in paper [1]. The domain wall creep rate measurements were cerried out by methods described in paper [2], however, in this case, a unipolar pulsating field (rectified from alternating 50 Hz) acted along the axis of hard magnetization. The static field H_L acted along the axis of easy magnetization. From the data obtained, the dependence $v(H_L)$ as well as curves of equal rates in the H_L, H_T scale were constructed. Fig. 1 shows the shape of curves of equal creep rates, threshold curves H_{cr} and curves of the start field of the domain wall $H_{w.st.}$ for the film thickness $d = 0.8\ \mu m$. In the direction along the axis of hard magnetization the bipolar field (Fig. 1a) and the unipolar field (Fig. 1b) acted.

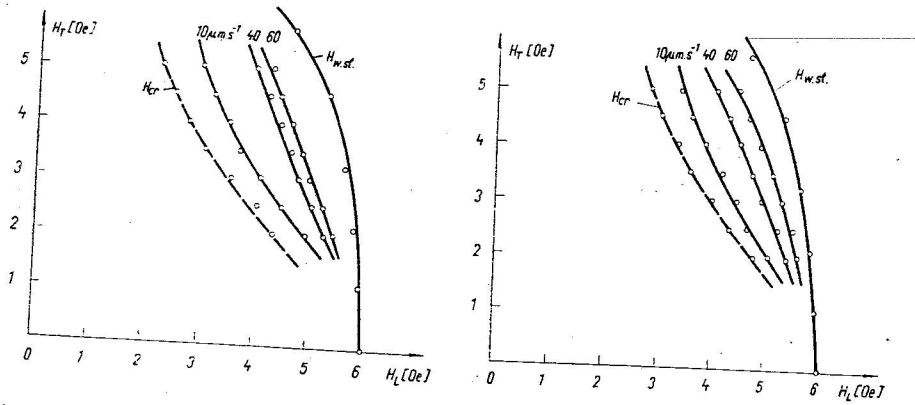

Fig. 1. Curves of equal domain wall creep rates, threshold curves H_{cr} and critical curves of the domain wall start field $H_{w.st.}$ (α) for film thickness $d = 0.8\ \mu m$ under the action of the: a. bipolar field (50 Hz); b. unipolar field, along the axis of hard magnetization.

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The dependence $v(H_L)_{H_T}$ constructed in the semi-logarithmic scale showed that, in the given case, the domain wall creep rate v increases exponentially with the field growth H_L:

$$v = v_0 e^{\alpha(H_L - H_{w.st.})},$$

where v_0 represents the creep rate for the field $H_L = H_{w.st.}$, coefficient α characterizes the steepness of the curves plotted in the semi-logarithmic scale [$\log v = f(H_L)_{H_T}$].

Comparing the figures (a, b), we can see that the domain wall creep in the unipolar field H_T proceeds more showly than in an equal bipolar field. Curves of equal creep rate and the threshold curves H_{cr} in the unipolar field are shifted closer to the critical curve of the domain wall start field.

The experimental results obtained prove that the bipolar field facilitates the domain wall creep more than the unipolar field. This phenomenon can be explained by the strengthening effect of magnetostatic „magnitudes" on the curved domain wall [3].

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