MAGNETIZATION ANALYSIS IN MICROMACHINED MAGNETIC FLAPS*

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Introduction

Mechanical motion of surface-micromachined magnetic flap arrays has been demonstrated in recent work [1,2]. In this work, singly-addressable, bulk-micromachined magnetic flaps have been fabricate], characterized, and analyzed with respect to magnetic characteristics. Flaps that were 40 μm thick ancl 4 mm by 4 mm in area, were micromachined fr on-J epitaxial silicon and coated with an evaporated and plated magnetic NiFe layer that is 11μm thick. The flap devices include 50 μm wide, 1 mm long serpentine springs which connect the flap to the substrate, and an evaporated and plated copper flat coil that is insulated from the magnetic layer and alters the magnetic layer's magnetization. While the magnetic layer's characteristics can be varied significantly, the magnetic layer in these flaps, as measured with a B-H loop tracer at 10 Hz, has an H_k of 155 Oe, $4\pi M_s$ of 9.5 kG, coercivity of 10 Oe, and relative permeability near 1 00; and is isotropic in-plane.

References and Acknowledgments

[1] C. Lui, et al. *Transducers 95*, pp. 328-3:3], 1995.

[2] J. W. Judy, et al. *Transducers 95*, pp. 332-335.1995.

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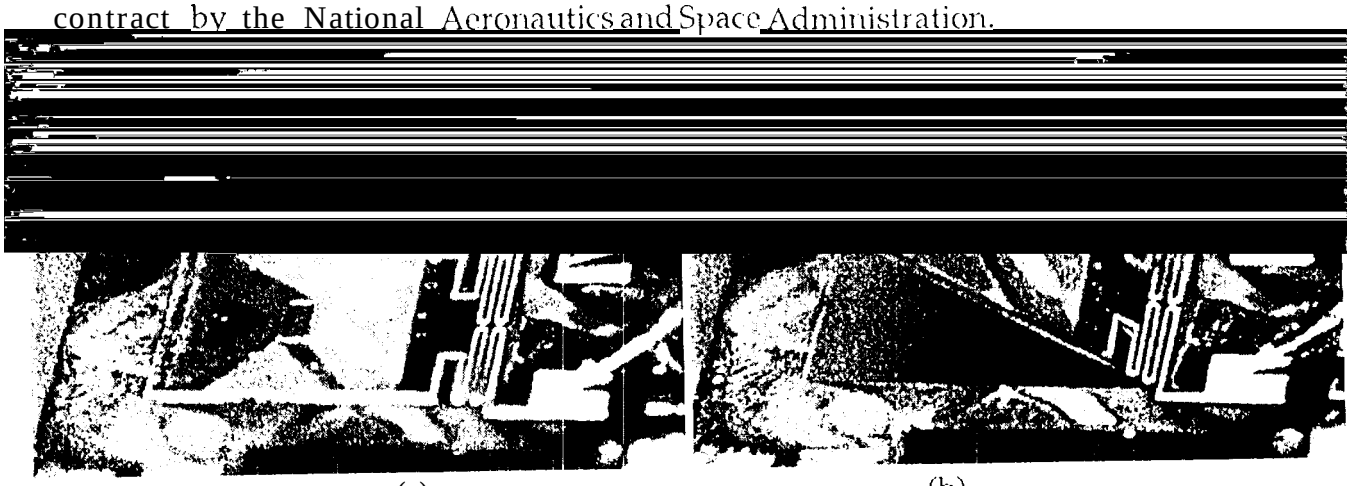
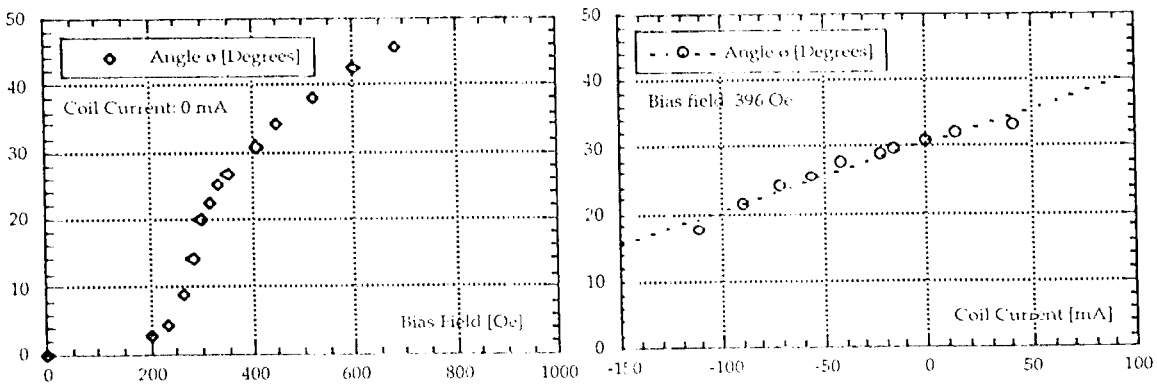


(a) (b)

Fig. 1. Picture of a magnetic flap at I_c=0 mA, showing (a) ø= O at H_b= O Oe, and (b) ø =30° at H_b= 400 Oe.



(a) (b)

Fig. 2. Static flap angle, ø, as a function of (a) H_b, at I_c= 0 mA, and (b) I_c at H_b=396 Oe.

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