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Stray Fields and Metastable Magnetization Configurations in Thin Films ADEBANJO ORIADE, Department of Physics and Astronomy, University of Delaware, Newark DE 19716, SIU-TAT CHUI, Bartol Research Institute & Department of Physics and Astronomy, University of Delaware, Newark DE 19716 — An important aspect of the utility of magnetic tunnel junctions and the giant magneto-resistive effect devices is reversal of the magnetization of a thin film. In these devices, found in hard disk drive read heads and magneto-resistive random access memory technology, robust control of magnetization in thin films is necessary. We study, via Monte-Carlo simulations, the nature of metastable (intermediate) magnetization states in thin films and their connection to failure in the reversal process. These metastable states usually show up as plateaus in the hysteresis loop close to the switching field. The net magnetization of the film in this state is much less than the saturation magnetization. Details of the magnetization configuration in, and during reversal of, these metastable states are presented. Two mechanisms for failure are described. (1) Strong stray fields that exist during the reversal of these metastable states will affect other elements within as much as $1\mu m$ from the longest edge of an $0.2\mu m \times 1\mu m \times 50\mathring{A}$ film. (2) Turning field off whilst the film is in a metastable state results in relaxation into a paramagnetic state, useless for application.

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