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Magnetic Reversal Energy Loss and Dynamics in Permalloy Thin Films and Microstructures CORNELIU NISTOR, ESHEL FARAGGI, JAMES L. ERSKINE, Department of Physics, The University of Texas at Austin — Magnetic hysteresis energy loss scaling and switching dynamics was studied in thin (20 nm) permalloy films and patterned microstructures using the magneto-optic Kerr effect. Sinusoidal, triangular and square magnetic waveforms of peak amplitudes up to 100 Oe and frequencies covering 10 decades (1mHz to 10 MHz) were applied to the samples while monitoring the magnetic response at 1 ns temporal resolution and 1 μm spatial resolution. All films and microstructures exhibited similar loss scaling behavior characterized by the dynamic coercivity $H_c*(\omega)$: an "adiabatic" region described by the averaged static coercivity H_0, followed by a region of monotonically increasing loss described by a power law: $H_c*(\omega) = H_0 + A(dH/dt)^{\alpha}$. The scaling function is derived from a domain wall dynamics model based on a linear ramp field. Exponents, α, obtained from fits to scaling measurements are independent of H_0 for microstructures obtained from the same parent film, suggesting universal behavior. The basic loss mechanism (thin film limit) at both low and high frequencies appear to result from large-angle local spin damping. Supported by NSF-DMR-0404252.

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