Nonlinear stationary ac response and dynamic magnetic hysteresis of antiferromagnetic nanoparticles in superimposed ac and dc bias magnetic fields

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The nonlinear ac stationary response of antiferromagnetic nanoparticles subjected to both external ac and dc fields of arbitrary strength and orientation is investigated using Brown'scontinuous diffusion model.[1] The nonlinear ac susceptibilitiesand dynamic magnetic hysteresis (DMH) loops of an individual antiferromagnetic nanoparticle[2] are evaluated[3] and compared with the linear regime[4] for extensive ranges of the model parameters (anisotropy, damping,etc.). It is shown that the nonlinear ac stationary response strongly depends on the antiferromagneticparameter characterizing the nanoparticle.

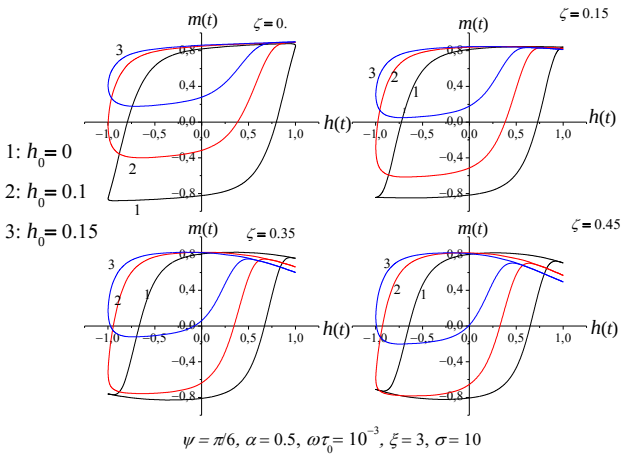

Figure. (A): DMH loops [the normalized magnetization $m(t)$ vs. the normalized ac field $h(t)=\cos\omega t$] for various values of the dc field $h_0=\xi_0/(2\sigma)$ and antiferro-magnetic ς parameters atdamping $\alpha=0.5$ and $\omega\tau_0=10^{-3}$ [ξ and ξ_0 are, respectively, are the external acand ac field parameters, σ is the anisotropy parameter, ψ is the angle between the ac field and the easy axis of the particle, τ_0 is a characteristic relaxation time with a typical estimation $\tau_0\sim10^{-10}$ s].

References

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