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Control of perpendicular magnetic anisotropy and intrinsic Gilbert damping in $L1_0$ordered FePt(Pd) thin films XIN MA, Department of Applied Science, College of William and Mary, Williamsburg, Virginia, PAN HE, LI MA, Shanghai Key Laboratory of Special Artificial Microstructure Materials and Technology and School of Physics Science and Engineering, Tongji University, GUANGYU GUO, Department of Physics and Center for Theoretical Sciences, National Taiwan University, Taipei, Taiwan, HAIBIN ZHAO, Department of Optical Science and Engineering, Fudan University, Shanghai, China, SHIMING ZHOU, Shanghai Key Laboratory of Special Artificial Microstructure Materials and Technology and School of Physics Science and Engineering, Tongji University, GUNTER LUEPKE, Department of Applied Science, College of William and Mary, Williamsburg, Virginia — The dependence of perpendicular magnetic anisotropy (PMA) and intrinsic Gilbert damping α_0 on some leading parameters, such as spin-orbital coupling strength ξ, are investigated in $L1_0$ ordered FePt(Pd) thin films by time-resolved magneto-optical Kerr effect measurements and spin dependent ab initio calculations. Continuous tuning of PMA and α_0 over a wide range of magnitude is realized by modulating the chemical substitution and ordering. Spin orbital coupling strength can be effectively adjusted by replacing Pt with Pd atoms, which keeps other leading parameters with negligible changes. Measured PMA and α_0 from experiment are proportional to $\xi^{1.6}$ and ξ^2 at 200K, while first principle calculations predict for both a quadratic dependence on ξ. The degree of chemical order in real samples can also significantly affect PMA and $\alpha_0$through leading parameters other than spin orbital coupling strength.

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