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Ultrafast magnetization dynamics in heterogeneous granular FePt media PATRICK GRANITZKA, ALEXANDER REID, SIMES/SLAC, WILLIAM SCHLOTTER, GEORGI DAKOVSKI, ANKUSH MITRA, LCLS/SLAC, PADRAIC SHAFER, LBNL, VIRAT MEHTA, OLAV HELLWIG, HGST, ANDREAS SCHERZ, XFEL, JOACHIM STÖHR, HERMANN DÜRR, SIMES/SLAC — Granular FePt in the $L1_0$ phase is a key material for future magnetic data storage devices, supporting the smallest stable magnetic domains. Precessional eigenmodes have recently been studied with fs laser pump-probe techniques[Becker, et al APL 104, 152412 (2014)]. Large 400 GHz eigenfrequencies are observed due to the huge FePt magnetic anisotropy. However, such optical techniques only measure the collective spin precession of all grains without spatial resolution. Here we investigate the nanoscale aspects of magnetization dynamics in FePt with fs X-ray pulses from the Linac Coherent Light Source at Stanford. We show that optical excitation leads to distinctly different magnetic responses due to the size distribution of FePt grains. While part of the laser-excited magnetic grains follow a small applied magnetic field, others do not. The former display heat assisted magnetic recording. In contrast, the magnetic anisotropy of the latter is not significantly affected by laser excitation. Such grains display the typical high-frequency magnetization precession modes. We show that the interplay of "weak" and "hard" grains leads to magnetic frustration in the ground state causing heterogeneity that is partially lifted by laser excitation.

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