Short-Time Limit for $L1_0$ Ordering of FePt Films

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FePt is a candidate material for the next generation of magnetic recording media because of its large magnetocrystalline anisotropy in the chemically ordered $L1_0$ phase. Low temperature deposition results in the low-anisotropy A1 phase, and either high-temperature annealing or deposition at high-temperatures is required to achieve the $L1_0$ phase.

In this project we have used a pulsed laser to explore chemical ordering in the millisecond regime. We have previously reported on the effect of pulsed laser annealing in reducing grain growth [1]. Here we focus on the short time limits for chemical ordering. We have both modeled and calculated the time-temperature profile of the FePt film resulting from the laser pulse. Chemical order parameters have been measured and a time-temperature-transformation (TTT) curve has been determined in the millisecond regime [2]. The TTT curve is in excellent agreement with model calculations done by Berry and Barmak [3]. It shows that partial chemical ordering can be achieved with effective thermal pulses as short as ~1 ms.

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