Structure-property relation in granular $\text{L}_1\text{O}$-FePt media

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Based on their high uniaxial magneto-crystalline anisotropy of $K_U = 6.6\,\text{MJ/m}^3$ granular $\text{L}_1\text{O}$-ordered FePt-C films are seen as promising material candidates for future hard disk media. Aberration-corrected high-resolution transmission electron microscopy (HRTEM) and vibrating sample magnetometry (VSM) are used to correlate the structural and magnetic properties of these films. HRTEM images in plan view geometry reveal a bimodal distribution of the particle size ($\bar{D} = 5.9\,\text{nm}$) while cross-sectional images are used to determine the orientation of the particles’ easy axes and of the underlying MgO seed crystal relative to the substrate normal. The texture spread of the [001] easy axes is roughly $3^\circ$ and thus larger than the misalignment of the MgO crystals which can be ascribed to the nucleation of FePt growth at MgO step edges [1]. The magnetic analyses exhibit a high anisotropy field of $\mu_0 H_A = 9.2\,\text{T}$ and a weak dipolar coupling between the matrix-separated nanomagnets.

References: