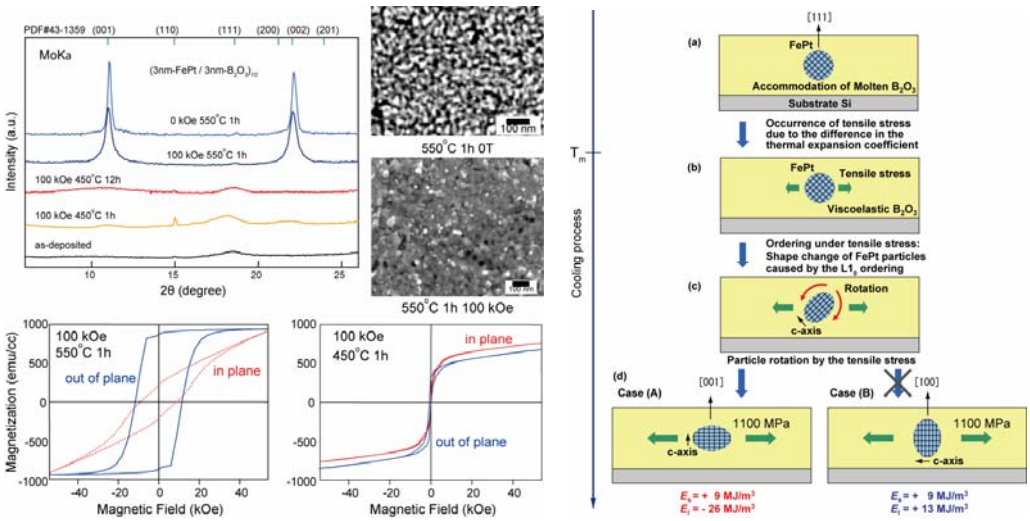
Mechanism of *c*-axis orientation of $L1_0$ FePt in $FePt/B_2O_3$ thin films

$FePt/B_2O_3$ 薄膜における $L1_0$ FePt の c 軸配向機構



To obtain a high-density magnetic recording medium using an $L1_0$ ferromagnetic ordered alloy, it is imperative to make its *c*-axis perpendicular to the thin film. In this work, we have investigated experimentally the *c*-axis orientation process of the $L1_0$ FePt in nanostructured $FePt/B_2O_3$ thin films and proposed its orientation mechanism on the basis of the micromechanics concept. We have found that a magnetic field tends to isolate nanoparticles and the plane-stress state plays a key role to make the *c*-axis perpendicular to the film surface. In-plane (biaxial) tensile stresses are considered to be yielded due to the thermal shrinking difference between the two materials, and ordered FePt particles with the *c*-axis perpendicular to the film surface is considerably stabilized under such in-plane tensile stresses in terms of the mechanical interaction energy.

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Reference: T. Ichitsubo, S. Tojo, T. Uchihara, E. Matsubara, A. Fujita, K. Takahashi, K. Watanabe, “Mechanism of *c*-axis orientation of $L1_0$ FePt in nanostructured $FePt/B_2O_3$ thin films”, Physical Review B 77 (2008) 094114.

$L1_0$ 型強磁性規則合金を用いた高密度磁気記録媒体を作製するためには，$L1_0$ 結晶 c 軸の面直配向が必須である．本研究では，$FePt/B_2O_3$ ナノ構造化薄膜の c 軸配向機構を提案した．強磁場により各々のナノ粒子は孤立化する傾向があり，また B_2O_3 との熱膨張率の差によって生じると考えられる二次元的な引張応力によって，力学的相互作用エネルギーが得するように粒子の c 軸配向・回転が起こることが示唆された．

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