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Numerical and Analytical Calculation of Magnetostatic Fields of a Nano Structured Ellipsoid

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As areal density of magnetic device increase, influence of stray field from neighbor becomes critical issue because it can affect the performance of device. In this work we did numerical calculation of stray field (Hs) of nano structured ellipsoid, by finite element method (FEM). An ellipsoidal object having lateral dimension of 212 nm (x-axis) × 106 nm (y-axis) × 3 nm (z-axis) with magnetic parameter M_s = 1,500,000 A/m was considered. Objective is magnetized along x-axis and the origin of arbitrary axis lies at the center of object. Calculated H_s on the central axis (Fig. 1(a)) showed very abrupt decrease with increasing the distance from the boundary (x = 106 nm) where the H_s is maximum. The magnitude of H_s at the location apart 150 nm from center was only 0.3 % of the value at 106 nm from center. And H_s at 4 nm above from the center of object also showed non-uniform distribution (Fig. 1(b)), which corresponds with the calculation with following equation

$$H = -\nabla\Phi(\mathbf{r}) = -\frac{1}{2}abc[\{A_e M_x - (\frac{xM_x}{(a^2+u)D(u)})\frac{\partial u}{\partial x}\}i - \{(\frac{xM_x}{(a^2+u)D(u)})\frac{\partial u}{\partial y}\}j - \{(\frac{xM_x}{(a^2+u)D(u)})\frac{\partial u}{\partial z}\}j] \quad [1]$$

where Φ is the magnetostatic potential.

So by integral of this equation through the space where the cell lies, stray field on the other cell on present of real cell can be calculated accurately.

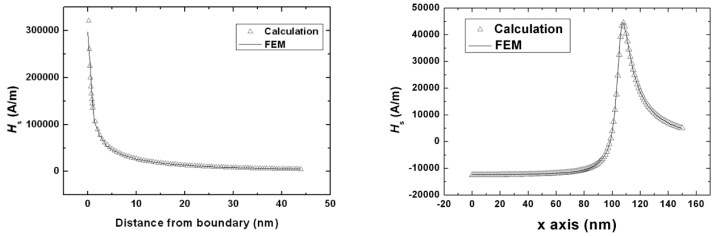

Fig. 1. (a) Hs at certral axis (b) z = 4 nm axis

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Thermo-spin Effects in Ferromagnetic/Paramagnetic Metallic Films

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In the field of spintronics, a spin current, a flow of electron spins, plays a central role in driving devices. In order to find versatile methods for generating spin currents, intense theoretical and experimental interests have been focused on the interplay among spin, charge, and heat currents [1, 2].

In this study, we have measured the novel spin-Seebeck effect in $Ni_{81}Fe_{19}$/*NM* (*NM* = Pt, Pd, Cu) films with changing the temperature gradient applied to the film. The observed signal can be argued in terms of the spin-orbit interaction and the spin-current generation [3] near the $Ni_{81}Fe_{19}$/*NM* interface.

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