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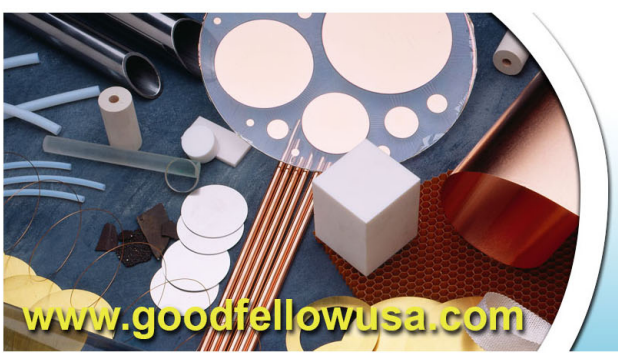

Magnetic force microscopy of single crystal magnetite (Fe_3O_4)(abstract)

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The micromagnetic domain structure of a magnetite (Fe_3O_4) single crystal has been studied using a magnetic force microscope (MFM). The MFM responds to the perpendicular component of the stray field above the magnetite surface. The sample was polished in the (011) plane. In this case, there are two easy magnetic axes parallel to the surface. Surface domains observed near cracks and edges have a complex closure structure (see Fig. 1), while walls seen far from such boundaries have a sinusoidal structure. Of particular interest is the presence of walls with either even or odd symmetry of the perpendicular stray field component across the transition. These can be conventionally modeled as Bloch or Neel walls, respectively. Both types of walls have been modeled and compared with the experimentally observed structures. We find the Bloch domain walls to be about 300 nm wide, nearly twice the value expected from bulk wall calculations. This distinction is consistent with a surface broadening of the domain wall due to magnetostatic effects.[1]

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[1]M. R. Scheinfein, J. Unguris, R. J. Celotta, and D. T. Pierce, Phys. Rev. Lett. **63**, 668 (1989).

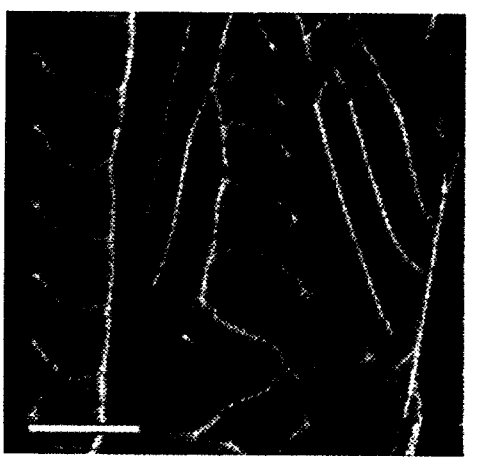

FIG. 1. MFM image of domain walls in a single crystal of magnetite. Bloch walls around closure structures are clearly visible. The domain walls are an average of 300 nm wide. The white scale bar in the lower left is 12 μm.

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