

Domain Walls in Nano-thin Permalloy films (Invited)

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Nano magnetic devices and current interest in nano-magnetism has motivated a new look at domain walls appropriate to such small sizes. Although the analytic expression for a Bloch Wall in soft magnetic material, such as Permalloy, was useful for large structures and thick films, understanding walls in thin layers as used in nano-devices is best served by computer simulation. An extensive study of walls in Permalloy like films as a function of film thickness has been made and will be discussed.

For micron and sub-micron layers, it is clear that the static and dynamic shape of the wall is dominated by Neel caps at each surface and a vortex in the body of the film. These structures become the defining characteristic for the very thin films. The wall width, shape and extent are all manipulated by Neel caps and vortex extent. Wall mobility is sensitive to the shape, i.e. it depends upon whether the wall center is moving into the vortex or away. When the walls are put in a small size structure the interaction with the boundary of the film is greatly influenced by the vortex. For example, the vortex can keep the wall from the edge if it is on the edge side of the wall but does nothing if on the opposite side.

References

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