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To who it may concern

This is to certify that **Mr. Deepanshu Gurjar**, a student of St. Xavier's College, Mumbai, has undertaken a project under my supervision in the summer of 2019. He worked on a project related to **shape anisotropy of ferromagnetic materials using micro-magnetic simulations**, as implemented in OOMMFC package. His performance was found to be exemplary.

Sincerely,

Somnath Bhowmick
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STUDY OF SHAPE ANISOTROPY FOR CYLINDRICAL GEOMETRY USING OOMMFC

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ABSTRACT

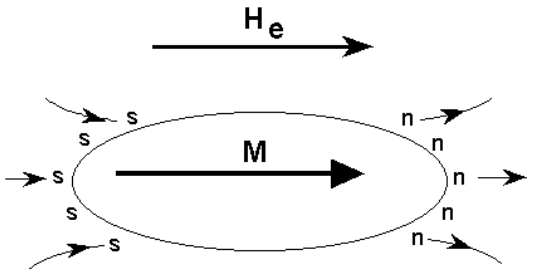
Micromagnetic is a field of physics which deals with the prediction of magnetic behaviors at sub-micrometer length. The length consider are large enough to to ignore the quantum nature of magnetic moment and considering magnetic moment as continuous function of space. It deals with static equilibria, by minimizing the magnetic energy.

KEYWORDS

Magnetic materials, Exchange constant, Exchange Interaction, Demagnetization, Domain, Magnetization, Effective Field, Shape Anisotropy

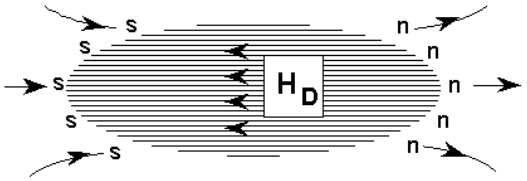
INTRODUCTION

A magnetized body will produce magnetic charges or po surface charge distribution, acting in isolation, is itself a field, called the demagnetizing field. It is called the dem acts in opposition to the magnetization that produces it.



Magnetization Produces Apparent Suface Pole Distribution

For example, take a long thin needle shaped grain. The demagnetizing field will be less if the magnetization is along the long axis than if is along one of the short axes. This produces an easy axis of magnetization along the long axis. A sphere, on the other hand, has no shape anisotropy. The magnitude of shape anisotropy is dependent on the saturation magnetization.



Demagnetizing Field Due to Apparent Surface Pole Distribution

For magnetic material, smaller than about 20 microns, shape anisotropy is the dominant form of anisotropy. In larger sized particles, shape anisotropy is less important than magneto-crystalline anisotropy.

$$H_i = H_e - H_D$$

$$H_D = NM$$

N= demagnetizing factor