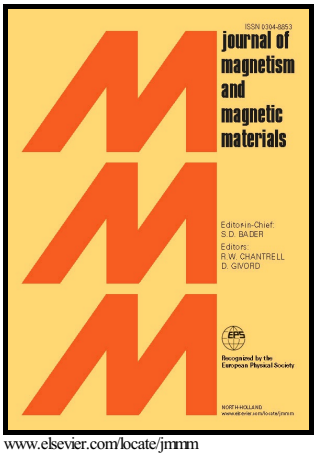

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Surface magnetic structures in amorphous ferromagnetic microwires

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Abstract.

The spatial period of magnetization perturbations that occur near the surface of magnetic nanotube or nanowire under the influence of surface magnetic anisotropy is determined by means of numerical simulation as a function of the sample geometry and material parameters. The surface magnetization distribution obtained is then used to estimate the period of the surface magnetic texture in amorphous microwire of several micrometers in diameter by means of appropriate variational procedure. The period of the surface magnetic texture in amorphous microwire is found to be significantly smaller than the wire diameter.

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Keywords: Surface magnetic anisotropy, Surface magnetic structure, Amorphous ferromagnetic microwire, Numerical simulation

1. Introduction

Surface magnetic anisotropy [1], which can exist at ferromagnetic surfaces and interfaces, may have a significant influence on magnetic properties of thin magnetic films [2-5] and magnetic nanoparticles [6,7]. The influence of surface anisotropy leads to a magnetization reorientation transition in a very thin ferromagnetic film if surface anisotropy constant exceeds certain critical value [8-10]. In magnetic nanoparticles surface anisotropy causes the existence of non-uniform micromagnetic states [6]. However, possible influence of surface magnetic anisotropy on the behavior of amorphous ferromagnetic microwires of several micrometers in diameter [11] has not been studied so far. Meanwhile, in some cases nearly periodic magnetic perturbations were observed [12,13] at the surface of ferromagnetic amorphous microwires, their nature being not clear. From a theoretical point of view, the existence of equilibrium domain structure in amorphous microwire of a perfect cylindrical shape is energetically unfavorable [14]