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Nanostructured Magnetic Cofecu Electrodeposits On Self-Assembled Mesoporous Silicon

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Abstract:

Nanofabricated magnetic structures have attracted much attention in recent years as a result of their exceptional properties compared to the bulk material. Moreover, the use of porous materials to elaborate these structures is considered as very promising candidates for filling with a metal leading to self-assembled nanostructures for application in spin valve devices and high density data storage [1-3]. CoFe based alloys soft magnetic thin films are largely utilised in the magnetic actuation for microelectromechanical systems (MEMS) and magnetic storage devices.

In this work CoFeCu thin films were electrodeposited in self-assembled mesoporous Si from baths containing sodium acetate as a complexing agent and pH of around 5. Self–organized quazi-2D regular pore arrangements, with a diameter about 80nm and a depth 3 µm have been fabricated by electrochemical anodization process in hydrofluoric acid solution. Electrodeposition conditions were varied in order to achieve optimum soft magnetic properties. The effects of current density on the morphology, microstructure and magnetic properties of the deposited CoFeCu films were analysed by SEM, EDS, SIMS and VSM. The results indicated that the coercivity and saturation magnetization of the films varied with deposition current density. It is found that the coercivity of films decreases when the current density is higher than 5mA/cm^2. Finally, the CoFeCu deposits exhibit soft magnetic proprieties and parallel magnetic anisotropy.

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