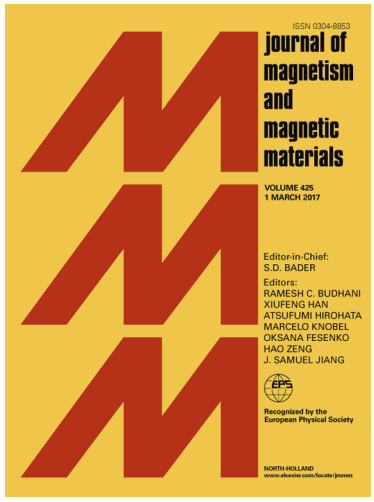

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Effect of annealing on magnetic properties and structure of Fe-Ni based magnetic microwires

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Keywords glass-coated microwires, soft magnetic properties, Taylor- Ulitvosky technique, magnetostriction, annealing, stress relaxation, crystallization.

Abstract

We studied the magnetic properties and domain wall (DW) dynamics of $Fe_{47.4}Ni_{26.6}Si_{11}B_{13}C_2$ and $Fe_{77.5}Si_{7.5}B_{15}$ microwires. Both samples present rectangular hysteresis loop and fast magnetization switching. Considerable enhancement of DW velocity is observed in $Fe_{77.5}Si_{7.5}B_{15}$, while DW velocity of samples $Fe_{47.4}Ni_{26.6}Si_{11}B_{13}C_2$ is less affected by annealing. The other difference is the magnetic field range of the linear region on dependence of domain wall velocity upon magnetic field: in $Fe_{47.4}Ni_{26.6}Si_{11}B_{13}C_2$ sample is considerably shorter and drastically decreases after annealing. We discussed the influence of annealing on DW dynamics considering different magnetoelastic anisotropy of studied microwires and defects within the amorphous state in $Fe_{47.4}Ni_{26.6}Si_{11}B_{13}C_2$. Consequently we studied the structure of $Fe_{47.4}Ni_{26.6}Si_{11}B_{13}C_2$ sample using X-ray diffraction and the atom probe tomography. The results obtained using the atom probe tomography supports the formation of the B- depleted and Si-enriched precipitates in the metallic nucleus of Fe-Ni based microwires.