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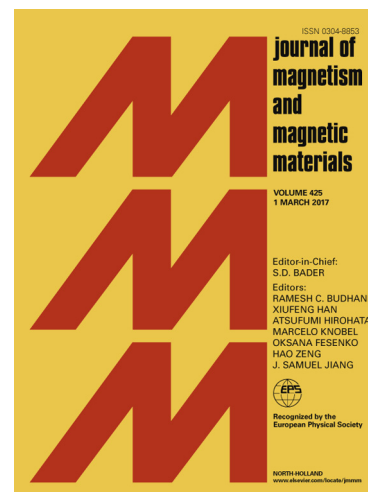
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Effects of applying tensile stress at the annealing temperature during annealing on the GMI and induced anisotropy of Fe-Cu-Nb-Si-B alloys

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Abstract

Nanocrystalline Fe_{73.5}Cu₁Nb₃Si_{13.5}B₉ ribbon samples possess excellent soft magnetic properties. Three forms of annealing treatment were performed on amorphous Fe-Cu-Nb-Si-B ribbon samples. The microstructure of the ribbon samples is studied using synchrotron radiation XRD. It is seen that upon annealing, a microstructure of nanocrystalline phase embedded in a residual amorphous matrix is achieved. The application of tensile stress (i) at the annealing temperature till cooling down to room temperature and (ii) from room temperature throughout the annealing process till cooling down to room temperature both show a clear difference in the XRD peaks in the directions parallel and perpendicular to the ribbon directions indicative of an induced structural anisotropy. The transition from the amorphous phase to the nanocrystalline phase was also confirmed by the GMI and transverse field anisotropy measurements. The application of tensile stress at the annealing temperature induces an anisotropy similar to the conventional stress annealing process, with about 5% less strain. This could be a method of reducing the brittle fracture problem of nanocrystalline ribbon samples.

Keywords: XRD; Giant magnetoimpedance; Synchrotron radiation

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