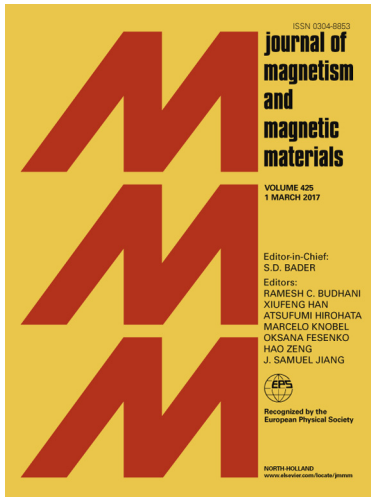

Effects of punching process on crystal orientations, magnetic and mechanical properties in non-oriented silicon steel

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Effects of punching process on crystal orientations, magnetic and mechanical properties in non-oriented silicon steel

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Abstract

In an attempt to investigate the effects of punching process on crystal orientations, magnetic and mechanical properties in non-oriented silicon steel, the steel sheet was punched for circular shape of Φ40mm. The crystal orientations and small-angle grain boundaries were characterized by electron backscatter diffraction (EBSD). The results indicated that the initial crystal orientations within a distance of 200μm away from the sheared edge were significantly changed after the punching process. In this area, the fractions of the directions with a high value of magnetocrystalline anisotropy energy E_a, <111>, <212> and <112> can reach up to 0.619. However, the fractions of the directions <001> and <113> accounts for only 0.096, which have a lower value of E_a. Moreover, the fraction of small-angle grain boundaries markedly increased in the area of about 200μm from the sheared edge, which is mainly attributed to the dislocations multiplication and dislocations motion. The magnetic domain structures were characterized by an optical microscope according to the Bitter method. The results showed that the width of magnetic domain in the sheared edge was much larger than that in the center and the patterns also existed a big difference. The Vickers $HV_{0.1}$

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