

Effect of Al Contents on Magnetic Domains of {100} Grains in Electrical Steels

Authors : Hyunseo Choi, Jaewan Hong, Seil Lee, Yang Mo Koo

Abstract : Non-oriented (NO) electrical steel is one of the most important soft magnetic materials for rotating machines. Si has usually been added to electrical steels to reduce eddy current loss by increasing the electrical resistivity. Si content more than 3.5 wt% causes cracks during cold rolling due to increase of brittleness. Al also increases the electrical resistivity of the materials as much as Si. In addition, cold workability of Fe-Al is better than Fe-Si, so that Al can be added up to 6.0 wt%. However, the effect of Al contents on magnetic properties of electrical steels has not been studied in detail. Magnetic domains of {100} grains in electrical steels, ranging from 1.85 to 6.54 wt% Al, were observed by magneto-optic Kerr microscopy. Furthermore, the correlation of magnetic domains with magnetic properties was investigated. As Al contents increased, the magnetic domain size of {100} grains decreased due to lowered domain wall energy. Reorganization of magnetic domain structure became more complex as domain size decreased. Therefore, the addition of Al to electrical steel caused hysteresis loss to increase. Anomalous loss decreased and saturated after 4.68% Al.

Keywords : electrical steel, magnetic domain structure, Al addition, core loss, rearrangement of domains

Conference Title : ICMM 2018 : International Conference on Magnetism and Metallurgy

Conference Location : Singapore, Singapore

Conference Dates : January 08-09, 2018