

Investigation magnetic Barkhausen noise from domain wall motion in the grain and grain boundary under tensile stress

Jia Liu¹, Guiyun Tian¹, Bin Gao¹, Kun Zeng¹

¹School of Automation Engineering, University of Electronic Science and Technology of China, China

Magnetic Barkhausen noise (MBN) is sensitive to the micro magnetic parameters, which has been proved as a nondestructive method for stress measurement. Micro-magnetic parameters can be affected by grain and grain boundary microstructure, which can further affect magnetic domain structure, domain wall (DW) motion and MBN. In addition, the inhomogeneity of material can affect interface the accurate of stress measurement via MBN. In this paper, domain walls motion in the grain and grain boundary of the silicon steel sheet which are captured by the magneto-optical Kerr effect (MOKE) microscopy, are used to evaluate the varies of micro magnetic parameters (such as DW motion, magnetization process, coercive force, etc.) with different stress state. Magnetic head that have high spatial resolution is used to detect MBN signal in the grain and grain boundary. The tensile stress changes magnetic domain distribution and domain wall motion in the different locations. The magnetization process and hysteresis loop are different inside grain and around the grain boundary, which can affect different activity of MBN. The micro-macro correlation between domain wall motion and MBN in different locations with different stress state is analyzed to evaluate the effect of microstructure on stress measurement via MBN. The difference of DW motion and MBN in different locations is highly affect by the tensile stress. The proposed work has potential for interpretation the effect of microstructure on MBN under tensile stress by studying DW motion, which can be further applied for enhancing accuracy on stress measurement.