

# Current Induced Barkhausen Noise Technique

C. Birkefeld, S. Hillmann, U. Cikalova, H. Funke

<sup>1</sup> Fraunhofer Institute for Ceramic Technologies and Systems, IKTS Dresden, Germany;

Keywords: Barkhausen Noise, Current Induced, NDE, NDT

\*e-mail: claudius.birkefeld@ikts.fraunhofer.de

Today Barkhausen Noise (BN) measurement is an efficient nondestructive technique for materials characterization. Usually the noise is detected by a coil while the magnetic hysteresis of the test material is cycled by an electromagnet. Due to magnetostrictive effects BN is highly sensitive to materials stresses and can be used for quantitative determination of residual stresses and external mechanical loads. The interaction of the magnetic structure (magnetic Bloch walls) with the microstructure of the material results in BN signals that are very sensitive to microstructure variations. Quantification of plastic deformation, of hardness, tensile strength, yield strength, and hardness depth are typical applications.

Other innovative techniques of creating BN by electric current magnetization (Eddy field technique) (see Figure 1) opens new areas of applications for Electromagnetic Non Destructive Evaluation. When an alternating electric current is used to excite a sample by electric current noise can be detected within the noise related to the Barkhausen Effect and is sensitive to re-magnetization processes. The sensitivity of the effect to residual and applied stresses can be used to develop this technique as a principle for stress sensor technology [1]. The current BN sensors are very large and not optimal application surrounding and must be specially adapted for each kinds of different component geometries. These facts are very cost and time consuming and discourages many potential users. The Eddy field BN sensors are more compact than conventional sensors and can work in the sophisticated small samples geometries.

The paper presents an idea of development of Eddy field BN sensor as well as its realization in a first prototype system. The Figure 2 shows the probe for Current Induced Barkhausen Noise Technique. Additionally the paper will show the results of the application of this novel sensor on samples with different hardness and stress conditions

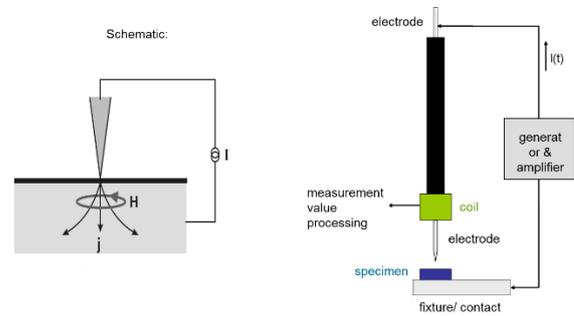


Figure 1. Principle of Eddy Field Technique



Figure 2. Current prototype device of Eddy Field BN sensor on IKTS.

**Acknowledgments:** This work was supported by EU-EFRE - Sächsische Aufbaubank - (SAB), project EnBaStro.

- [1] S. Hillmann, N. Meyendorf, *A new Barkhausen noise technique for applications at miniaturized geometries*, 10th International Conference on Barkhausen Noise and Micromagnetic Testing; 40th NDE, 10th ICBM; Volume 33A and 33B; Baltimore, Maryland, USA, 21-26 July 2013.