Development of Barkhausen Noise Device for Micromagnetic Testing

U. Cikalova[1], C. Birkefeld[1], S. Hillmann[1], H. Funke[1], T. Stüwe[1]
T. Glöckner[2], M. Drobisch[2], D. Kammel[2], M. Klein[2]
M. Protzmann[3]
Th. Dreßler[4], M. Wenzel[4]

[1]*Fraunhofer Institute for Ceramic Technologies and Systems, IKTS Dresden, Maria-Reiche-Straße 2, 01109 Dresden, Germany*
[2]*SURAGUS GmbH, Maria-Reiche-Straße 1, 01109 Dresden, Germany*
[3]*dresden elektronik ingenieurtechnik gmbh, Enno-Heidebroek-Straße 12, 01237 Dresden, Germany*
[4]*IMA Materialforschung und Anwendungstechnik GmbH, Wilhelmine-Reichard-Ring 4, 01109 Dresden, Germany*

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The Barkhausen Noise (BN) technique is a good alternative for the e.g. conventional stress and hardness measurement. However, due to the significantly complex calibration effort it has been used only for selected niche applications in recent years. In addition, the current BN sensors are very large and sensitive to the external perturbation by not optimal application surrounding and must be specially adapted for each kind of different component geometries. This is much cost and time consuming and discourages many potential users.

The paper presents an idea of development of a basis for new BN Device for two-dimensional determination of material properties, as well as the progress in use of calibration-less method and its transmission to the development of a compact and robust measuring system. The new system can open the possibility to test the material parameters as residual stress and microstructure change level at different times in the life of the industrial functional and construction components with less effort. A new auto-calibration method analyzes two-dimensional stresses. A fixed calibration function is based on definition material characteristic parameters. To adjust the auto-calibration function to the experimental reference values by varying functional parameters, a large number of measurement points should be used. For this approach the unconventional multi-pole probe was developed. For the work on the sophisticated small samples geometries the Eddy field BN sensor, as more compact than conventional sensors was developed simuntaniosly.

The paper presents the realization and investigation of the modified Barkhausen Noise measurement technique, which later contributes to the development of a compact and robust pilot measurement system Barkhausen Noise Analyzer BNA (see Figure 1). Various types of sensors were realized for different application scenarios and used in the measurement setup. The calibration algorithms were newly adapted and implemented, which ensure safe handling of the method even under industrial conditions.

In the tensile test the strength parameter was changed in the elastic range, whereby the changes in the Barkhausen Noise were detected simultaneously with the BNA pilot system. The BNA parameter sensitivity to the structural changes was defined as a function of the insitu stress state.

With the BNA pilot system, the changes in the stress states at different, stress-relevant points of big component are recorded as a function of the stress during the insitu test. The results of these studies will be presented in the paper as well.

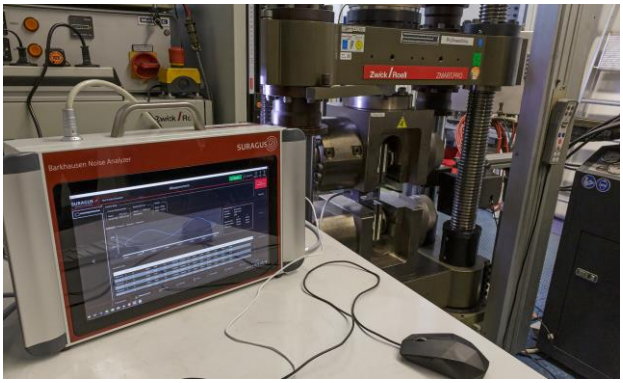

Figure 1. BNA equipment system during the testing on tensile machine

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