

Automated testing of the electrical properties of thermally sprayed insulating oxide coatings

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Electrically insulating, thermally sprayed coatings are mostly used in installation, energy and engine engineering. The electrical properties of the predominantly alumina-based coatings are vital for their functionality. They are influenced by the material composition, the spray process, and the measurement conditions. In order to investigate how the latter affect measurements, an automated test stand was developed at Fraunhofer IKTS. It allows to measure the electrical breakdown strength, electrical resistivity, permittivity, and loss angle of the coatings. Various parameters such as the contacting of the sample, the relative humidity and storage conditions can be adjusted.

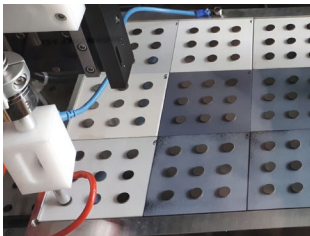


Fig. 1: Testing rod measures 9 samples at 9 measurement positions each.

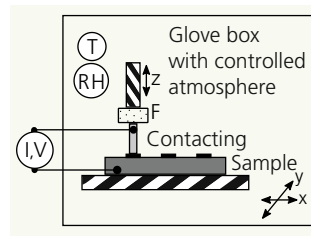


Fig. 2: Schematic of the test stand.

Automated testing, influence of humidity

The test stand is largely automated, based on the software developed at IKTS. A testing rod is moved to predefined measurement positions in a planar area of 210 x 210 mm² (Fig. 1, 2). For each measurement position, the electrical properties are determined at defined measurement conditions (e.g. contact force of the testing rod).

The electrical properties of the coatings depend strongly on the humidity (Fig. 3), which is why the test stand is set up inside a glove box with a controlled atmosphere. This makes it possible to adjust the humidity and investigate its effects.

Standardization of measurement conditions

The developed test stand was designed and constructed in an AIF/IGF project, in which the scientific base for the standardization of measurement methods for the electrical properties of thermally sprayed coatings was established. In particular, reliable and standardizable measurement setups and procedures for determining the electrical properties of thermally sprayed coatings were developed. As a result of the work, the standardization of the measurement methods by the DIN Committee on Standards NA 092-00-14 AA "Thermal spraying and thermally sprayed coatings (DVS AG V 7)" supported by Fraunhofer IKTS is envisaged.

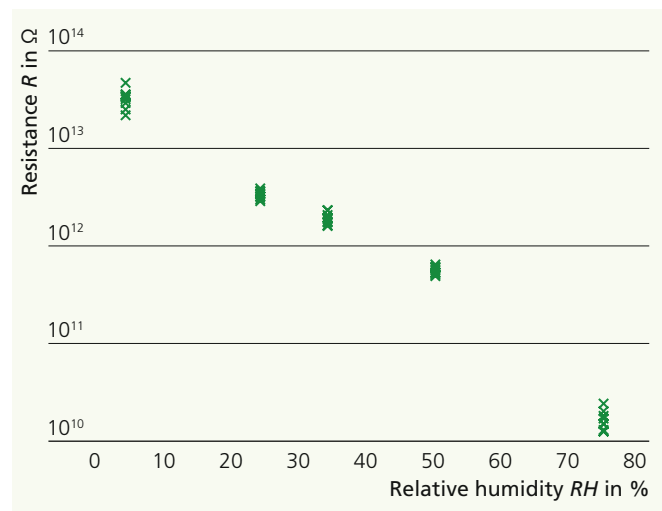


Fig. 3: Electrical resistance of a thermally sprayed Al₂O₃ coating as a function of relative humidity.

Services offered

- Characterization of electrically insulating, thermally sprayed coatings under controlled environmental conditions: electrical resistivity, permittivity and loss angle, dielectric breakdown strength
- Customized measuring systems for in-line quality control
- Development of test stands for customer-specific measurement tasks

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