

## MONITORING OF WATER RELEASE DURING VACUUM TREATMENT OF HIGH POWER CAPACITORS

### Fields of use

High power capacitors, Outgassing measurements, High power capacitors

### Current state of development

Already on the market

### Type of cooperation

Service agreements

### Intellectual property

Secret know-how.

### Developed by

Jožef Stefan Institute

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### Summary

Jožef Stefan Institute offers its expertise in the monitoring of water release from polymermetalized foils during the vacuum heat treatment of high power capacitors. These measurements are essential during the R&D phase and quality control in the production of high power capacitors before they are impregnated by special oils. A high breakdown voltage of a capacitor is required for a high-quality device over a long life-time.

### Description of the invention

We provide expertise in the monitoring of small and slow water release in evacuated capacitors during the scheduled thermal procedure. The kinetics of water releasing must be depressed before filling with special oil. Residual water, not expelled completely, slowly interacts with metalized foils and contributes the main part in deterioration and failure of capacitors much before desirable for customers. Besides the main task to expel most of the water, the drying process must proceed at conditions that are not harmful to metal parts as water vapour is aggressive at high temperatures.

The technical problem is solved by the determination of the pressure rise (out-gassing rate) of a material after a certain (thermal) treatment. This may also include a determination of the gasses being evolved (using quadrupole mass spectrometry).

These measurements and know-how are crucial in the R&D phase and/or at the later quality control of small evacuated sealed devices whose functionality inherently relies on the low level of pressure. In high power capacitors, break-down voltage tests in a vacuum can be applied to predict performance before filling with oil and when results are acceptable, the long-term performance can be estimated. For determination of the pressure rise only inert gauges are being used: a spinning rotor gauge, capacitance manometers and quadrupole mass spectrometer in a separate UHV chamber. The research team has decades of experience in the research and development of various types of evacuated sealed devices along with skills in vacuum science and technology & materials science.

### Main Advantages

- is highly sensitive, thus enabling measurements of a roll of metalized foil
- compare speed and quantity of released gas from samples with different geometry (width and shape of the roll)
- provides relation dependence of gas release kinetics to temperature
- determines the influence of pumping speed on gas release kinetics

Manufacturers of high power capacitors are sought for service agreements. The industrial partner is expected to describe their needs and requirements for vacuum characteristics measurements of their high power capacitors.