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TECHNOLOGY OFFER

Outgassing measurements for long-term insulation of vacuum sealed devices

Vacuum insulation panels (VIPs) and other vacuum sealed devices are used to provide high insulation in domestic appliances and buildings. In order to provide long life insulation of the VIPs, problems with vacuum have to be identified and prevented. We offer expertise and related know-how in low-pressure and outgassing related measurement systems, which is essential during the R&D phase and quality control of vacuum sealed devices.

Technology field: thermal insulation, vacuum sealed devices, outgassing measurements.

Vacuum insulation panels are modern thermal insulating elements which substantially increase energy efficiency of refrigerators, freezers and reduce power consumption of buildings. Their high performance thermal insulation is tightly connected with the vacuum in the panel, which is a guarantee for an effective insulation.

The key problem of any VIP with polymer envelope is its life expectancy, closely related to three gas sources:

1. **Leaky seals**
2. **Selectively permeable envelope**
3. **Outgassing/desorption of the envelope and core material itself**

For a set life expectancy the above described factors should remain below a specific limit.

We provide the expertise in the measurement of low pressure (from ultra high vacuum up to atmospheric pressure), particularly when monitoring small and slow pressure changes in vacuum insulation panels as well as in other vacuum sealed devices.

The following services are offered:

- **Determination of the pressure rise** (outgassing rate) of a material after certain (thermal) treatment, this may also include the determination of the gasses being evolved (using **quadrupole mass spectrometry**)
- **Permeation measurements** for various (even highly impermeable) materials
- **Vacuum processing**
- **Identification of leaks**
- **Determination of pressure and gas composition** accumulated inside small sealed devices
- Measurement of **thermal conductivity vs. internal pressure** for planar VIPs

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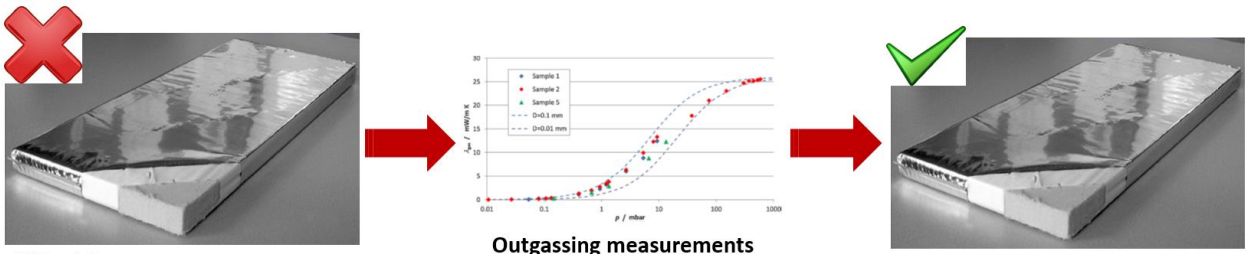

VIP with:
1. **Leaky seals**
2. **Selectively permeable envelope**
3. **Outgassing/desorption of the envelope and core material itself**

Outgassing measurements

Modifications for longterm high performance insulation of VIP

Picture source: http://www.starch.dk/private/energy/img/VIP.jpg

Outgassing measurements and know-how are crucial in the R&D phase and/or later quality control of small vacuum sealed devices whose functionality inherently relies on the low level of pressure inside them. The results of measurements are essential for producers of vacuum insulation panels. In the vacuum insulation panels, the long-term pressure rise can be predicted and thermal conductivity vs. internal pressure relation can be measured. With these measurements the life-time of the vacuum insulation panels can be rapidly estimated.

ABOUT JOZEF STEFAN INSTITUTE AND RESEARCH GROUP

The Jozef Stefan Institute is the leading Slovenian scientific research institute, covering a broad spectrum of basic and applied research. The staff of more than 960 specializes in natural sciences, life sciences and engineering.

The research group is part of Surface Engineering and Optoelectronics Department (F4) and has decades of experiences in the research and development of various types of vacuum sealed devices along with skills in vacuum science and technology & materials science. They have collaborated with the manufacturers of VIPs and manufacturers of core material of VIPs in the analysis of the VIP outgassing properties.

Selected publications:
Energy and Buildings (2015), 90, 137; New organic fiber-based core material for vacuum thermal insulation.
Applied Energy (2014), 114, 320; Synthesis and characterization of melamine-formaldehyde rigid foams for vacuum thermal insulation.
Vacuum (2015), 119, 112; Ultimate limits in the gas composition determination within small sealed volumes by quadrupole mass spectrometry.

TARGET SECTORS

Manufacturers of vacuum insulation panels and other vacuum sealed devices are sought for service agreements.

INTELLECTUAL PROPERTY

Know-how.

CONTACT DETAILS

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