NETZSCH

Applications Laboratory

Thermophysical Properties Section

Thermal Conductivity of

Lewco Super Mat

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Introduction

The Thermophysical Properties Section of the NETZSCH Applications Laboratory received Lewco Super Mat from Lewco Speciality Products Inc., USA, for thermal conductivity determination.

The guarded hot plate system GPH 456 *Titan*® from NETZSCH is capable of operation between -160°C and 600°C (T_{mean} = sample temperature). The system is ideally suited for the measurement of insulating materials with thermal conductivities of up to 1 W/(m·K). The system is vacuum-tight by design, allowing measurements to be carried out under inert and oxidizing atmospheres as well as under vacuum. Thanks to the innovative plate material and plate design as well as the innovative temperature measurement, the system allows measurements with outstanding precision and repeatability. The plate stack is positioned in an environmental chamber avoiding radial heat flow. Furthermore, the environmental chamber compensates for heat flow via the wiring. Therefore, the system is a true absolute measurement tool for the characterization of insulating materials. The system allows measurements at well-defined temperature differences (ΔT) of 2 K to 40 K over the sample. The system runs fully automatically. No user input is required during measurement. The system works in accordance with ASTM C 177, ISO 8302, DIN EN 12667 and DIN EN 12939. System control is realized with state-of-the-art, 32-bit MS® Windows™ software.

Further information about the GHP 456 *Titan*® can be found on the NETZSCH homepage:

https://www.netzsch-thermal-analysis.com/en/products-solutions/thermal-diffusivity-conductivity/ghp-456-titan/

Experimental

The material tested was “Lewco Super Mat”. The material was measured with spacers (thickness 14.5 mm). Two specimens with 300 mm x 300 mm were used for the test. The density during the measurement was approx. 195 kg/m³.

The measurements were performed under Nitrogen atmosphere (200 ml/min). The measured temperatures (T_{mean}) were -18°C, 121 °C, 260 °C, 399 °C and 500 °C (respectively 0 °F, 250 °F, 500 °F, 750 °F and 932 °F) with a temperature difference across the specimens (ΔT) of 20 K.

Results

Figure 1 depicts the thermal conductivity of Lewco Super Mat between 0 °F and 932 °F. The thermal conductivity increases with increasing temperature as expected for a porous insulation material due to higher heat transfer by radiation at higher temperatures. Table 1 summarizes the corresponding measurement data.

After the measurement a mass loss of approx. 6-7 % was observed, which is most probably caused by decomposition of PTFE. Pyrolytic soot was found on the plates of the instruments and the color of the sample changed from light grey prior to the measurement to dark grey/black after the measurement.

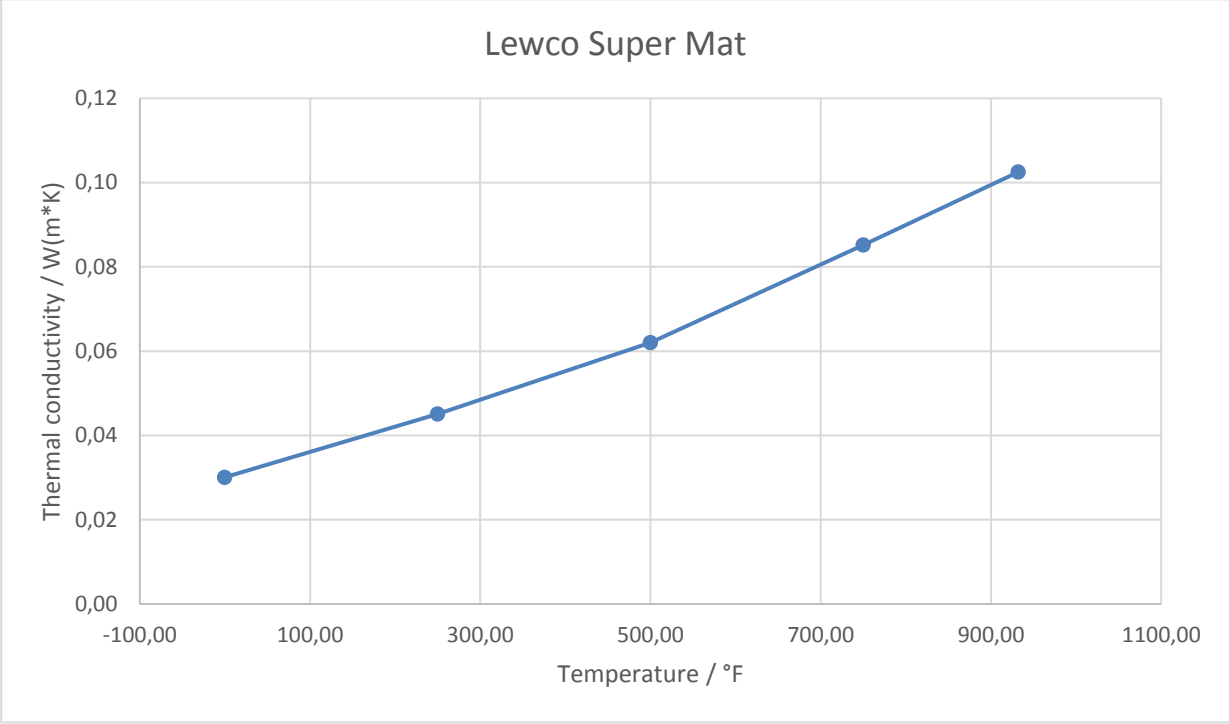

Figure 1: Thermal conductivity of Lewco Super Mat

Table 1: Thermal conductivity of Lewco Super Mat

Density @ RT ~ 195 kg/m³

Spacers (thickness) = 14.5 mm

T_{mean} / °C	T_{mean} / °F	∆ T / K	Thermal Conductivity / W/(m·K)	Thermal Resistance / (m²·K)/W
-17.99	-0.37	19.973	0.03007	0.4820
121.00	249.79	20.010	0.04507	0.3216
259.99	499.99	20.014	0.06203	0.2337
399.00	750.20	20.008	0.08521	0.1701
499.99	931.99	20.016	0.10250	0.1414

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