

Fraunhofer-Institut für Bauphysik IBP

Forschung, Entwicklung,
Demonstration und Beratung auf
den Gebieten der Bauphysik

Zulassung neuer Baustoffe,
Bauteile und Bauarten

Bauaufsichtlich anerkannte Stelle für
Prüfung, Überwachung und Zertifizierung

Institutsleiter

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Test Report HoS-003/2018

Determination of the solar properties according to ASTM E903-12 and determination of the emittance

Client

Liquisol bvba
Noorderlaan 147b9
2030 Antwerp
Belgium

Holzkirchen, December 5, 2018

1 Tested Material



painting on a film

2 Sampling

The Fraunhofer Institute for Building Physics in Holzkirchen received the painted film (135 mm x 210 mm) on November 26, 2018. Three samples of the size of approximately 50 mm x 50 mm were taken.

3 Description of the Samples

The samples do not have evident defects.

Sample number	R 192 01	R 192 02	R 192 03
Description	painting 2WHITE 	painting 2WHITE 	painting 2WHITE 

4 Test Area

sample size 50 mm x 50 mm

test area approx. 10 mm x 5 mm

approx. \varnothing 20 mm

in UV-Vis-NIR

in MIR

5 Test Method

The solar properties absorptance α , reflectance ρ and transmittance τ are determined according to ASTM E903-12. First, spectral transmittance $\tau(\lambda)$ and spectral reflectance $\rho(\lambda)$ are measured in the solar wavelength range from 300 nm to 2,500 nm with a Perkin-Elmer grating spectrophotometer Lambda 19 with double-beam configuration equipped with a 150 mm integration sphere using (near) normal radiation. A calibrated Spectralon standard is used as a reference material. The solar properties are obtained by calculating the weighted average using the Reference Solar Spectral Irradiance according to ASTM G173 "Direct Normal Irradiance AM 1.5 for the determination of the transmittance τ and reflectance ρ ". The solar absorptance α is calculated considering conservation of energy by $\alpha = 1 - \rho - \tau$.

The emittance is determined at a temperature of 283 K. First, spectral reflectance $R(\lambda)$ is measured using a FTIR-Spectrophotometer Bruker Vertex 70 equipped with a 75 mm integration sphere in the wavelength range from 2.5 μm to 50 μm (MIR). The reflectance R is obtained by calculating the weighted average of the spectral reflectance in the range from 2.5 μm to 50 μm using the Planck's radiation distribution for 283 K. Since there is no transmission in the decisive wavelength range, the emittance ε is calculated using Kirchhoff's law: $\varepsilon = 1 - R$.

6 Test Results

The measurements are carried out on December 3, 2018. Every sample is measured two times. The mean values are shown in the following table:

spectral range		300 nm – 2,500 nm (UV-Vis-NIR)			2.5 μm – 50 μm
Sample Number	Designation	Reflectance ρ [-]	Transmittance τ [-]	Absorptance α [-]	Emittance ε [-]
R 192 01	painting 2WHITE	0,86	0	0,14	0,91
R 192 02	painting 2WHITE	0,87	0	0,13	0,91
R 192 03	painting 2WHITE	0,87	0	0,13	0,91
R 192 mean	painting 2WHITE	0,87	0	0,13	0,91

The results only refer to the tested samples.

The tests are performed in a testing laboratory that has been accredited according to German standard DIN EN ISO 17025:2005 by the German Accreditation System DAkkS. The registration number is D-PL-11140-11-02.

This test report consists of 3 pages of text including 2 tables.

Holzkirchen, December 5, 2018

FRAUNHOFER INSTITUT FOR BUILDING PHYSICS

Head, Accredited Body



Prof. Dr.-Ing. Martin Krus

Dep. Head, Accredited Body /
Responsible Test Engineer



Dipl.-Ing. Almuth Schade