SphereOptics

Report: **01.08.2019**

Reflection measurements with the 410-Solar from Surface Optics Corporation

The company SphereOptics GmbH has made some test measurements with the 410-Solar model from Surface Optics Corporation (SOC). SphereOptics has compiled a report that documents the results of measurements with the 410-Solar and comparative measurements to give you an insight into the accuracy of this reflectometer.

The 410-Solar reflectometer is manufactured by SOC, who was founded in 1977 in California, USA. SOC is specialized into the characterization and exploitation of the optical properties of surfaces. From this expertise, SOC has developed a wide range of commercial products including instrumentation for laboratory and field optical measurements, Hyperspectral Video Imagers and processors as well as surface coating products and services.

The 410-Solar model is a battery-operated portable reflectometer, the ideal tool for field solar reflectance and absorption measurements. The SOC410-Solar conforms to ASTM E903, the standard test method for solar absorption, reflectance, and transmittance of materials to meet the industry standard in the USA. Based on a modified integrating sphere, it measures total reflectance at seven sub-bands within the 300-2500nm spectral regions.

Indicated values:

Diffuse Reference Targets with defined reflectance value	**410-Solar (SOC)** (@700-1100nm)	**Lambda-950 (Perkin Elmer)** (@700-1100nm)	**Deviation**
1. ~3.8%	3.60%	3.40%	0.2 %
2. ~6%	5.80%	5.80%	0.0 %
3. ~6.5%	6.20%	5.80%	0.4 %
4. ~10%	10.30%	9.80%	0.5 %
5. ~11%	11.50%	11.10%	0.4 %
6. ~20%	19.90%	19.70%	0.3 %
7. ~30% sample 1	27.50%	28.30%	0.8 %
8. ~30% sample 2	27.20%	28.20%	1.0 %
9. ~30% sample 3	28.00%	28.20%	0.2 %
10. ~49%	49.00%	48.90%	0.1 %
11.~52%	52.90%	53.20%	0.3 %
12. ~78%	75.60%	76.00%	0.4 %
13. ~95%	91.60%	91.30%	0.3 %

Averaged values !!

Table 1: SphereOptics has provided diffused optical materials for the measurement. They have different reflection properties. Two reflectance measurements were taken with one and the same sample. Once with the 410-Solar from SOC and once with the Lambda-950 from the company Perkin Elmer as comparison / reference measurement. The deviation shows the difference between the two devices.

We compared the 410-Solar from SOC with our Lambda-950 from Perkin Elmer, which we use in our laboratory for the calibration of reflectance, transmission and also the wavelength accuracy in a standard procedure according to DIN 5036 that has been proven for many years. These results of the measurements are the basis for this report.

We have chosen the spectral region between 700 nm and 1100 nm for this comparison. Eleven reflectance targets with values between 3.8% and 95% were measured three times each at randomly selected locations of the optical surface to compensate for possible inhomogeneities within a sample. The deviation within a sample was less than 0.5% We took the mean value of these three measurements for the following comparison.
The deviations of these measurements are documented in Table 1 and were below 1% for all of the 11 measured reflectance targets. The device allows a simple data export. The measured values are stored as ASCII files in order to be able to process them easily via Excel or other programs.

Applications:

- Validation of solar fields
- Maintenance of solar fields / evaluation of soiling of mirrors
- LEED – evaluation of thermal properties of green buildings
- Cool roof – evaluation of thermal properties of roofs
- Inspection of telescope mirrors
- Inspection of coatings for space applications
- Characterization of thermal properties of materials
- Characterization of solar receivers in solar power generation
- Characterization of mirrors used to concentrate solar power
- To evaluate surfaces on Lidar test targets

For more information, please contact SphereOptics on www.sphereoptics.de

or mail us info@sphereoptics.de

Author: Martina Neumann, SphereOptics GmbH