

--- Executive Summary ---



Spectral Measurements of Reflectance of the Spectralight Infinity

Material and its Comparison to other Similar Materials

**Prepared for: Solatube International, Inc.
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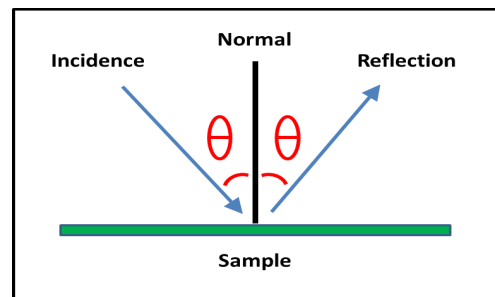
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Spectral reflectance of the Spectralight Infinity product from Solatube International, Inc. was measured over the UV/VIS/NIR wavelength range. The same measurements were performed on two similar products, coated with silver and enhanced aluminum respectively. Reflective performance of these products in several specific wavelength ranges are compared in this report.

The Perkin Elmer Lambda 1050 spectrophotometer was used to collect reflectance spectra for this project. It was fitted with the Universal Reflectance Accessory (URA) to collect specular reflectance spectra at three angles of radiation incidence: 8, 40, and 60 degrees. A 150 mm integrating sphere was used to collect total hemispherical reflectance spectra, where the angle of incidence was 8 degrees. Reference spectra were provided by a NIST traceable aluminum mirror.

In this study the angle of radiation incidence is defined as the angle from a plane normal to the sample surface, as shown in Figure 1. For specular reflectance measurements, the angle of incidence is equal to the angle of reflection. For total reflectance measurements, reflected light is collected at all angles in a hemispherical distribution.

Figure 1. Defining the angle of incidence



Summaries of mean reflectance over specific wavelength ranges are derived from the spectra and given in the tables of Appendix A. The Spectralight Infinity product proved to be superior to the other two materials in several ways. Its reflection of desirable visible light (400-700 nm) was around 99% or better at all angles tested, whereas the other materials averaged approximately 95% and 91% respectively. Significantly less of the potentially harmful UV radiation was reflected by the Spectralight product. Furthermore, much less heat producing NIR radiation was reflected by Spectralight, compared to the others. These optical properties make Spectralight Infinity an ideal product for use in the daylighting industry.

Appendix A Mean Reflectance Values of Tested Products over Specific Wavelength Ranges

Table 1. Mean Reflectance Values for the Spectralight Infinity Sample, %R

| Sample ID | Technique | Total Solar Range | UV Range | Human Vision Range | NIR Range |
|-------------------------|-------------|-------------------|------------|--------------------|-------------|
| | | 250-2500 nm | 250-400 nm | 400-700 nm | 750-2500 nm |
| Spectralight 8 Degrees | Specular %R | 36.42 | 27.17 | 99.58 | 24.88 |
| Spectralight 40 Degrees | Specular %R | 33.31 | 27.68 | 99.11 | 20.89 |
| Spectralight 60 Degrees | Specular %R | 33.73 | 31.03 | 98.96 | 21.14 |
| Spectralight 8 Degrees | Total %R | N/A | N/A | 99.51 | N/A |

Table 2. Mean Reflectance Values for the Silver Sample, %R

| Sample ID | Technique | Total Solar Range | UV Range | Human Vision Range | NIR Range |
|-------------------|-------------|-------------------|------------|--------------------|-------------|
| | | 250-2500 nm | 250-400 nm | 400-700 nm | 750-2500 nm |
| Silver 8 Degrees | Specular %R | 92.34 | 34.35 | 93.88 | 96.98 |
| Silver 40 Degrees | Specular %R | 92.53 | 35.43 | 94.92 | 96.99 |
| Silver 60 Degrees | Specular %R | 92.95 | 40.6 | 95.11 | 97.06 |
| Silver 8 Degrees | Total %R | N/A | N/A | 95.2 | N/A |

Table 3. Mean Reflectance Values for the Enhanced Aluminum Sample, %R

| Sample ID | Technique | Total Solar Range | UV Range | Human Vision Range | NIR Range |
|-------------------------|-------------|-------------------|------------|--------------------|-------------|
| | | 250-2500 nm | 250-400 nm | 400-700 nm | 750-2500 nm |
| Enh Aluminum 8 Degrees | Specular %R | 87.58 | 46.28 | 90.82 | 90.67 |
| Enh Aluminum 40 Degrees | Specular %R | 87.29 | 44.73 | 91.18 | 90.43 |
| Enh Aluminum 60 Degrees | Specular %R | 87.56 | 47.89 | 90.36 | 90.66 |
| Enh Aluminum 8 Degrees | Total %R | N/A | N/A | 94.21 | N/A |