



Measurement of high solar reflectance paint for roofs using the Model UH5700 Spectrophotometer

Thermal barrier coatings have the same coloring as ordinary paint. However, they reflect the infrared light that is the source of heat from sunlight, and control the propagation of radiant heat to internal structures. JIS K 5675¹⁾ specifies a test method for quantitative assessment of the reflectance properties of high solar reflectance paint for roofs against sunlight. Here, we introduce an example of calculating the solar reflectance of paint using the Model UH5700 Spectrophotometer.



Model UH5700 Spectrophotometer

¹⁾ JIS K 5675 High solar reflectance paint for roof use

Measurement of solar reflectance according to JIS K 5675

- ✓ The Model UH5700 Spectrophotometer was equipped with a Ø60 integrating sphere accessory attachment to measure the reflection spectrum of three types of samples of applied coatings in accordance with JIS K 5675 (Figure 1).
- ✓ In JIS K 5675, the reflectance spectrum is multiplied by weighting factors and the weighted average is taken to calculate the solar reflectance. In addition, the solar reflectance (near-infrared) and separately calculated brightness L* were used to assess samples in accordance with Table 1.
- ✓ A near-infrared solar reflectance of 84.8% and L* value of 94.7 were obtained for coating B. Since the reflectance value of 84.8% is higher than the criterion of 80.0% specified in the bottom row of Table 1, the sample was judged to be conforming.
- ✓ Solar reflectance and assessment results can be calculated automatically by using the optional UV Solutions Plus software.

Equipment configuration

Model UH5700 Spectrophotometer
 Ø60 integrating sphere accessory device (P/N: 2J3-0171)
 Control software: UV Solutions Plus

Measurement conditions

Scan speed: 300 nm/min (UV-Vis)
 1000 nm/min (NIR)
 Slit: 5 nm (UV-Vis), automatic (NIR)
 PbS sensitivity: 2
 Sampling interval: 1 nm

Formula for computation

$$\text{Solar reflectance } \rho_e = \frac{\sum_{\lambda} E_{\lambda} \cdot \Delta\lambda \cdot \rho_{IR}(\lambda)}{\sum_{\lambda} D_{\lambda} \cdot V_{\lambda}}$$

$E_{\lambda} \cdot \Delta\lambda$ Standard solar radiation weighting factor (W/m²)

ρ_{IR} Reflectance (%)

Table 1 – Near-infrared wavelength criteria

Conditions	Judgment
$L^* \leq 40.0$	$\rho_{IR} \geq 40.0$
$40.0 < L^* < 80.0$	$\rho_{IR} \geq L^*$
$L^* \geq 80.0$	$\rho_{IR} \geq 80.0$

L*: Lightness, ρ_{IR} : Solar reflectance (780 to 2500 nm)

Reflectance spectra and calculation results

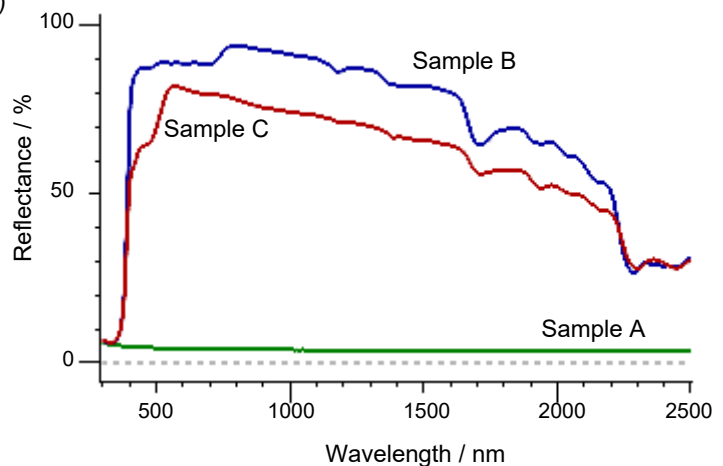


Figure 1 - Reflectance spectra of paints

Table 2 - Calculation results for solar reflectance

Wavelength range	UV-Vis region (%)	NIR region (%)	ALL WL region (%)	Judgment Result
	300 to 780 nm	780 to 2500 nm	300 to 2500 nm	
Sample A	4.6	4.1	4.4	NG
Sample B	82.2	84.8	83.2	OK
Sample C	69.8	69.8	69.7	NG

Note: The external appearance and specifications of the products mentioned in this technical report are subject to change for improvements. The data appearing in this document are to present an application example and are not a guarantee of performance.

[KEY WORDS]

spectrophotometer, UH5700, paint, solar reflectance, lightness L*, JIS K 5675