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Specular Reflectance Standard MRC-3200

Product Sheet

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T: (608) 831-2141 • Fax: (608) 831-3076

I. BACKGROUND

Specular reflectance reference standards are usually evaporated metal surfaces that have high reflectance. Unfortunately the reflectance of such surfaces is not absolute, and can vary depending on the technology used to develop the surface. In addition, the evaporated films are sensitive to mechanical and chemical exposure and can, in practice, change over longer periods of time.

The **Specular Reflectance Standard** is made of a specially treated germanium element that acts as a single germanium reflective surface. The germanium is an ideal material for a reflectance standard, because its high refractive index provides a strong signal, and because it is known to be chemically inert within the 1-14 pH range. The chemical and mechanical stability of the **Specular Reflectance Standard** makes it uniquely suitable for monitoring instrument stability.

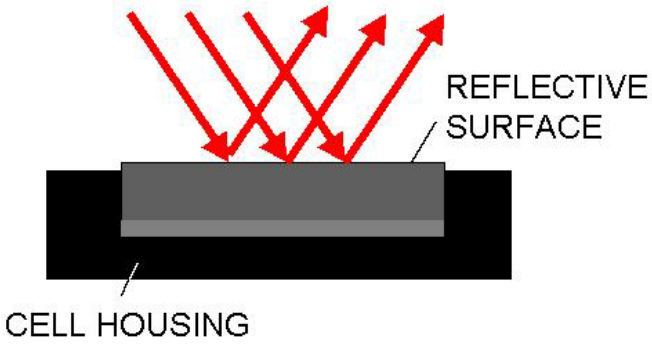

Diagram of Specular Reflectance Standard

The unique treatment of the germanium element in the **Specular Reflectance Standard** allows only reflection from the front surface of the element to reach the detector. Overall, the **Specular Reflectance Standard** behaves optically as a single germanium surface. The reflection of light off of a single optical surface is governed by the Fresnel equations. In a simple case of perpendicular illumination, assuming no absorbance of the media, the reflectance depends only upon the refractive index of the material.

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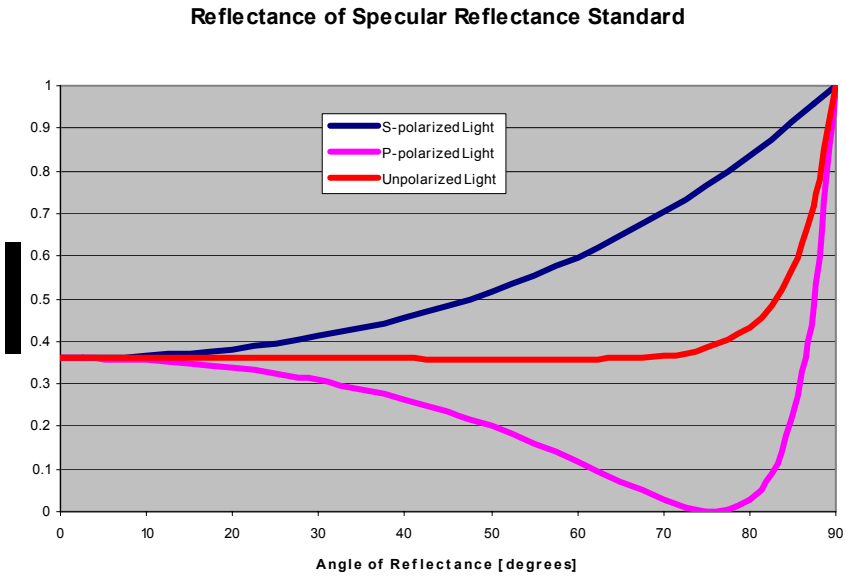
II. USE OF THE SPECULAR REFLECTANCE STANDARD

The **Specular Reflectance Standard** has a nominal reflectance using polarized or unpolarized light. At normal incidence the reflectance of polarized and unpolarized light at 4000 cm^{-1} is shown below:



The values of the reflectance ($R_{standard,nominal}$) can be found in the Appendix as a function of the angle of the illuminating light and as a function of wavelength in the mid-infrared region. The given values were tabulated at 27 degrees C, but the temperature dependence of the reflectance is minimal. The measured and the tabulated values enclosed with of the **Specular Reflectance Standard** are very close on a well-designed instrument. The tables contain the reflectance as a function of angle and wavelength and the values are shown for s-, p-polarized light and unpolarized illumination.

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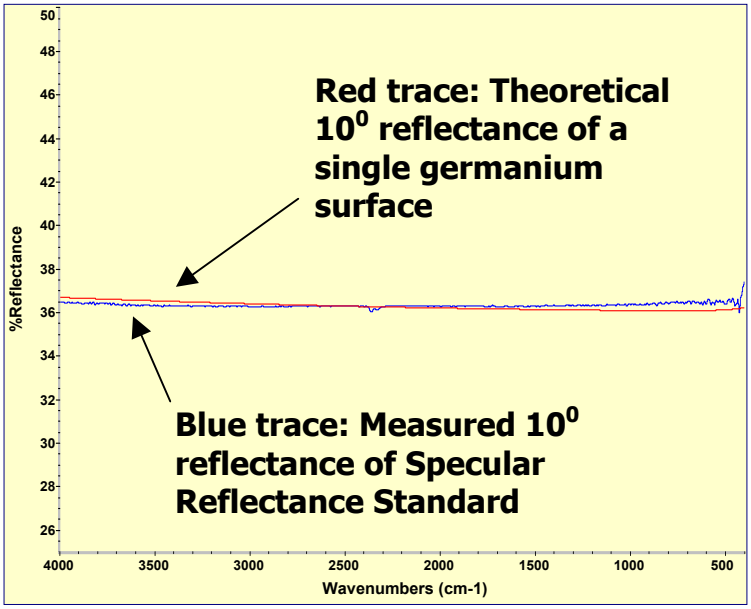

The values can be used to correct the measured values of other materials. For example, if one wants to measure the reflectance of a gold mirror, the actual reflectance for the gold mirror (R_{sample}) can be calculated from the measured $R_{sample,measured}$, the nominal and the actual reflectance of the **Standard** ($R_{standard,nominal}$, $R_{standard,measured}$).

$$R_{sample} = R_{sample,measured} \frac{R_{standard,nominal}}{R_{standard,measured}}$$

Please note that the measured values will vary if the light is not a single beam of light with each ray having the same exact angle, such as a laser. Light beams in real instruments are either converging or diverging, thus the nominal angle is an idealized approximation. Even collimated beams have rays that are not coaxial with the centerline of the collimated beam.

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PRODUCT WARRANTY

There is a 90-day warranty for material and workmanship for the MRC-3200. Breakage of the optical element is not covered by this warranty, unless the damage occurred during shipment. Shipping costs are not included.

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