TECHNICAL SPECIFICATIONS

SOC-100

HEMISPHERICAL DIRECTIONAL REFLECTOMETER

SURFACE OPTICS CORPORATION

The SOC-100 Hemispherical Directional Reflectometer (HDR) & application software provide a powerful tool set for engineering applications and a unique capability for characterizing the optical properties of materials.

KEY FEATURES

Coupled to the Thermo Scientific™ Nicolet™ iS50 FTIR Spectrometer, the SOC-100 provides polarized, angular diffuse reflectance measurements from 8° to 80° incident angles, for the entire spectral region covered by the FTIR.

The spectral region is nominally 2.0 to 25.0 µm using the standard FTIR optics, and can be extended to 200 µm using mid-/far-IR optics.

Traditional techniques for measuring the diffuse reflectance of materials use an integrating sphere to capture the diffusely scattered energy. Because of energy considerations inherent to integrating spheres, useful measurement data is limited to about 14 µm. The SOC-100 uses a 2π imaging hemiellipsoid to illuminate the sample using a 700°C blackbody. A movable overhead mirror captures the energy reflected at angle and directs a collimated beam into the FTIR. This measurement of the hemispherical directional reflectance (HDR) is identical, by the reciprocity theorem, to the directional hemispherical reflectance (DHR).

Because the hemiellipsoid images the blackbody source onto the sample, energy throughput is maximized, and polarized measurements can be performed into the far infrared. Measurements are made relative to a known calibrated specular reflectance.

The SOC-100 also provides the capability to measure the collimated and scattered transmittance of samples, and by using a specular beam blocker, the diffuse and specular partition of the scattered energy.

APPLICATIONS

- Support of IR image simulation and IR material development
- Identification and measurement of surface contaminants
- Characterization of scatter and degree of specularity
- Measurement of polarized reflectance data for calculation of optical constants (n, k) of bulk and powdered materials
- Emittance as a function of temperature and wavelength for heat transfer analysis
- Provides full scattered transmittance data into large angles up to a hemisphere of 2π steradians.

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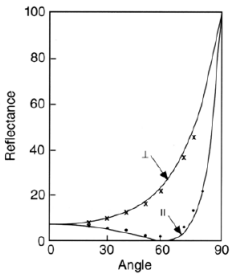
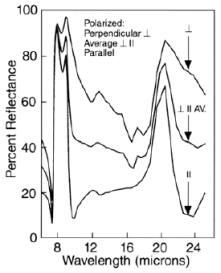
MEASURED DATA

- Parallel, perpendicular & unpolarized reflectance at 12 user selected angles between 8° and 80°.
- Separation of the reflectance into diffuse and specular components.
- Collimated and scattered transmittance at 0° incidence.
- Directional emittance as a function of wavelength and temperature beyond 500°C.
- Total hemispherical emittance as a function of temperature.
- Data format selection: ERAS, ASTM tabular formats, graphical, linear and log scale, μm or cm-1, reflectance vs. wavelength, and reflectance vs. angle.





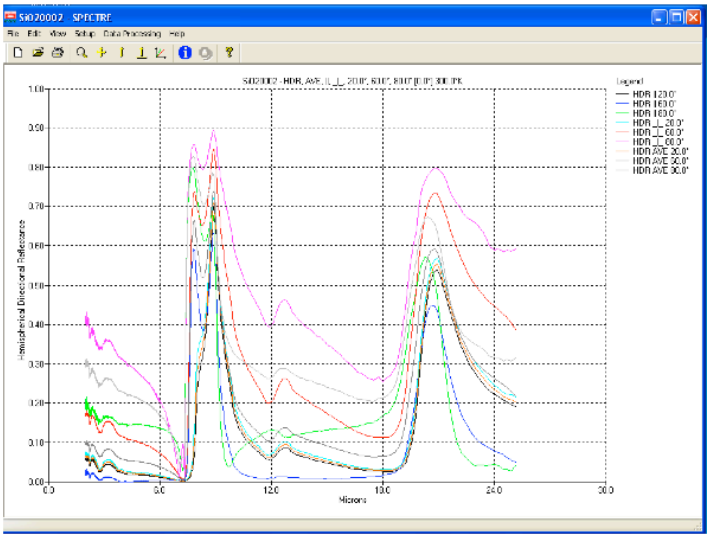
LEFT: REFLECTANCE-PERPENDICULAR, PARALLEL FUSED SILICA AT 12 MICRONS.

RIGHT: REFLECTANCE VS WAVELENGTH

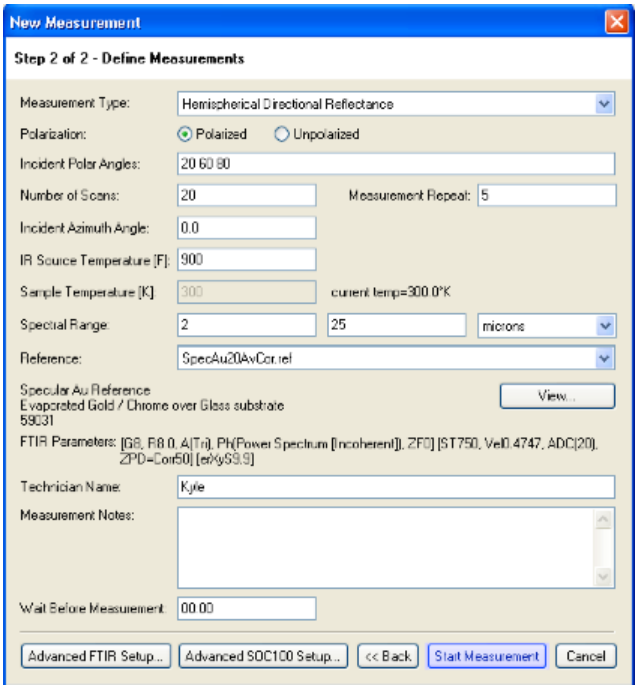
SPECTRE SOFTWARE

The SPECTRE (SPECtral Transmittance Reflectance and Emissivity) software provided with the SOC-100, features a Microsoft Windows® interface and drives the FTIR and controls all aspects of the data collection, including project management, data archiving and report generation.

It is compatible with the OMNIC software packaged with the Thermo Scientific™ Nicolet™ iS50 FTIR.



MAIN WINDOW



SPECTRE SOFTWARE NEW MEASUREMENT WINDOW

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Measurement Configuration	Automated reflectometer 18″ electroformed hemiellipsoid mates to a state-of-the-art spectrometer.
Measurement Calibration	Comparison of scans of the specimen sample and calibrated specular gold standard at each angle polarization combination establishes accurate calibration of the measured directional reflectance.
Source	A custom heated cavity provides uniform 2π steradian radiation into the subtended hemiellipsoid from a 0.75″ ID opening centered at one ellipse focus. All cavity surfaces, excepting the opening, are insulated with high performance Min-K insulation and the unit is surrounded by a water cooled jacket.
Spectral Range	Wavelength coverage depends on FTIR optics as shown in the following table.
Resolution	Depending on data requirement: 2, 4, 8, 16, or 32 cm-1 resolution may be employed.
Sample Size	Standard: 1″ OD. Sample mounting can accommodate up to 3″ x 5″ samples.
Computer Controller Measurements	The automated process is computer controlled by five stepper motors which provide: polarization (parallel, perpendicular and unpolarized), variable incident angles, sample standard interchange, beamblocker angles. The source beam chopping is synchronized to the movement of the FTIR mirror which eliminates the sample self-emission error.

	λ(μm)	cm-1
Standard	2.0 - 25.0	5000 - 400
Solid Substrate	14.0 - 200.0	700 - 50