

## THERMAL EMITTANCE ANALYTICAL REPORT

### Purpose:

The purpose of the analysis was to measure the thermal emittance of two samples (curved heater and flattened heater).

### Sample ID's:

Two samples, described as:

- Curved Heater
- Flat Heater

### Experimental:

The analysis was performed at Optical Data Associates, in Tucson, AZ, USA. Only the front of each sample was analyzed.

The IR measurements were performed on a ThermoScientific iSIO Fourier Transform Infrared [FTIR] spectrophotometer equipped with a 102-mm diameter InfraGold integrating sphere from Labsphere. The wavelength range was 2 to 25  $\mu\text{m}$ , the spectral interval was 15.43  $\text{cm}^{-1}$ , and 128 scans were averaged for each scan. The reference for the total transmittance [T] measurements was the baseline; the reference for the total reflectance measurements was an InfraGold standard from Labsphere.

### Calculations:

Thermal Emittance values were calculated using the following test methods:

**ASTM E903:** STANDARD TEST METHOD FOR SOLAR ABSORPTANCE, REFLECTANCE, AND TRANSMITTANCE OF MATERIALS USING INTEGRATING SPHERES

**Results:**

The results are summarized in Table 1. Charts and data used to generate the results are available upon request.

**Table 1: Analysis Results**

<b><u>Name</u></b>	<b><u>Thermal Emittance</u></b>
Curved.	0.526
Flat	0.459

**Discussion:**

In the future it would probably be more accurate to measure the tubing as it is used, i.e., put a few in a row across the aperture. This would measure unflattened tubing and show the effect of parallel tubes.

The samples were expected to be carbon, but appeared to be metallic (copper colored) which would explain the relatively high emissivities measured (compared to carbon) since metals tend to be high emitters.

**Laboratory Information:**

Optical Data Associates is a small, specialized lab that performs high end optical measurements. They have been in business since 1991 and have worked with over 800 different companies, performing many specialized optical measurements.

**MCS-242196, HEALTHMATE TOTAL IR E FACTOR AT 8° AOI**  
**CURVED [THERMAL R = 0.473/THERMAL E = 0.527]**  
**FLAT [THERMAL R = 0.541/THERMAL E = 0.459]**

