NEAR-INFRARED REFLECTANCE SPECTROSCOPY OF VENUS-ANALOG ROCKS AT VENUS SURFACE TEMPERATURES. A. H. Treiman[1], J. Filiberto[1], K.E. Vander Kaaden[2]. [1]Lunar and Planetary Institute, 3600 Bay Area Blvd. Houston TX 77058 <treiman@lpi.usra.edu>. [2]Jacobs, NASA Johnson Space Center, Mail Code XI3, Houston, TX 77058.

Introduction: Venus' surface can be viewed in emission through the relatively opaque atmosphere via a few spectral 'windows' in the near-infrared (NIR, most near 1 µm) [1]. Venus' surface appears to show emissivities that correlate with surface geology [2-4], and these emissivity variations are interpreted as differences in surface rock type (mafic vs. silicic) and/or extent of weathering (Fe^{2+} silicates vs. Fe^{3+}-oxide-coated).

To understand and quantify the observed variations in NIR emissivity, laboratories are measuring high-T NIR emissivity directly [5,6]. For example, the measured emissivities of basalts in the wavelength range 0.85 – 1.2 µm are ~0.9. This value can be tested by measurement of reflectance, because Kirchoff's Law holds that emissivity (**e**) = 1 – reflectance (**r**). The **r** of basalt in the NIR is ~0.1 [7] so its **e** should be ~0.9.

However, high-T NIR **e**'s of silicic igneous rocks (granitic, rhyolite) are reported to be 0.8-0.9 [5,6] (but see [8]), which is inconsistent with **r** values of 0.3-0.7 of such rocks at room-T [7,9]. For both datasets to be correct, the **r** values of silicic igneous rock would have to decrease precipitously between room and Venus surface temperatures. This seems unlikely.

Samples & Methods: We measured reflectances of rough surfaces of: alkali basalt, tholeiite, and dunite (Spitsbergen, Norway); granite (San Gabriel Mts., CA); hematite-coated basalt (Vesuvius, Italy); dacite (Mt. Hood, CA), and sandstone (UT). Standards were rods of polycrystalline MgO and graphite, with estimated **r**'s of 0.95 and 0.05 respectively. **r** values at 25°C (350 – 2500 nm) were measured with a Spectral Evolution OreXpress Spectrometer using its contact reflectance probe.

Then, reflectances at ~470°C were measured on samples and standards in a box furnace, illuminated by a 950 nm LED flashlight (Figure 1). The materials were imaged through a ~900 nm long-pass filter with a pocket digital camera, that was modified to pass NIR light. Average DN were taken from JPG images; the DN were converted to **r** values by interpolating between the standards' DNs, after calculating (and un-doing) the camera's γ-correction. A γ=3 yielded a linear response between pixel DN and **r** values from a photographic gray card (950 nm flashlight at room temperature).

Conclusion: 950 nm **r** values of most common rocks at ~470°C are similar to those measured at 25°C (Table 1). Our **r** for dunite is comparable to that for olivine at high T [10,11]. The tholeiite became partially coated with hematite during heating, which accounts for its increase in **r**. So, for most substances, one can estimate their NIR **e** at Venus surface T from room-T **r**, following Kirchoff's Law. We calculate that silicic igneous rocks (e.g., granite, dacite) will have **e** values of 50-75% [8], far lower than reported recently [5,6]. These lower **e** values imply that silicic igneous rocks should be readily recognizable with orbital NIR emissivity measurements.

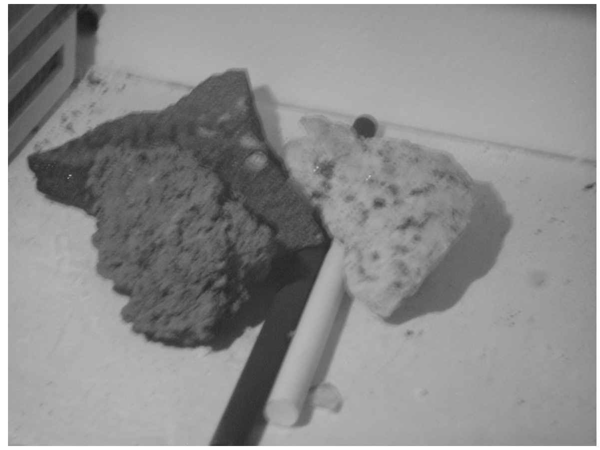

Figure 1. Rocks and standards at ~470°C, imaged in ~950 nm light. Rocks (clockwise from left) are: hematite-coated basalt, tholeiite basalt, granite. DN here used for Table 1.

Table 1. Reflectances, **r** (%) at 950 nm.

	Temperature	
Substance	25°C	~470°C
Alkali Basalt	4	5
Tholeiite	6	10
Granite	48	49
Dacite	25	22
Dunite	9	6
Hm. Basalt	18	15
Sandstone	41	38

Work supported by NASA grant 80NSSC17K0766.

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