***JPL* ANALYTICAL CHEMISTRY LABORATORY** **I150**

Flight Hardware Materials Analysis Group
Thermal and Propulsion Section 3530

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Subject: Optical Flats: Low Volatility Residue Analysis

Purpose

Two optical flats were submitted for chemical analysis of oily Low Volatility Residue (LVR). A cleaned flat and an uncleaned flat (in plastic container) were compared.

Method

Direct reflectance off the flats was measured from 2.5 to15 microns with an FTIR spectrometer using a microscope attachment. The residue was then removed from the flats with dichloromethane. The edge of the flats were included in the rinse and contributes to the total LVR. The LVR was analyzed using Micro-Diffuse Reflectance/ Fourier Transform Infrared (DRIFT/FTIR) spectroscopy. FTIR provides chemical functional group information for quantitative analysis and qualitative identification of materials.

Results

Reflectance in the mid-infrared region 2.5 to ~15 microns is very similar for both flats. There are no peaks detected in this mode that can be attributed to contamination.

Trace analysis shows the uncleaned flat had ~0.2 micrograms per square centimeter (ug/cm2) of aliphatic hydrocarbon and silicone (polydimethyl siloxane)*. This explains why the surface of the optic would not wet with water. This is a relatively thin coating and is not likely to significantly attenuate a beam in the 0.4 to 25 micron wavelength region. The cleaned flat had ~0.16 ug/cm2 of an aliphatic hydrocarbon. There was additional mixed silicate that could be from particles.

* This is ~20 angstrom film, assuming the residue has a density of 1 g/cc.