EFFECTS OF DUST ON THERMAL INFRARED REFLECTIVITY OF IRON METEORITE CANDIDATES FOUND BY THE MARS EXPLORATION ROVERS.

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Introduction: The discovery of an iron meteorite and two additional candidates on the surface of Mars at both Mars Exploration Rover (MER) locations using the Miniature Thermal Emission Spectrometer (Mini-TES) [1] demonstrates a remote sensing tool useful for their identification, which should be considered in future missions. The importance of exogenic material in general, as witness samples for Martian weathering (among other science priorities), cannot be overestimated. In the special case of irons, while wind abrasion can readily remove oxyhydroxide coatings (evidence of past water exposure) from metal surfaces, such materials may be easily preserved within cavities common to these rock types. We are therefore interested in determining the obscuring effects of dust on TIR spectra from both bare and oxidized iron meteorite substrates.

Background: Metals are highly reflective in the infrared with significantly reduced thermal emissivities [e.g. 1]. Iron meteorites stand out on Mars against the background of indigenous rocks in the way that they reflect downwelling atmospheric sky radiance. Martian dust is a problem for all remote sensing because of its ability to obscure underlying surfaces both in the TIR and visible light [e.g. 2]. Following on the results presented in [3], where oxidized surfaces were evaluated, this work focuses on the effects of dust on reflectivity of bare metal surfaces in the TIR.

Methods: Using the Nexus 670 FTIR interferometric spectrometer at ASU's Mars Space Flight Facility, TIR spectra were collected of a Meridiani Planum (MP; formerly Heat Shield Rock [4]) analog with Martian dust analog [5] loading in incremental stages to monitor spectral variations in a controlled environment. This abstract reports on the effects of dust coatings on both sandblasted, and cut and polished, samples of the Canyon Diablo IAB coarse octahedrite. An artificial, quartz-based control was placed within the spectrometer environmental chamber to simulate downwelling atmospheric sky radiance on Mars, and monitor its thermal reflectivity.

Results: Recognition of the quartz signature in the spectrum of the Canyon Diablo slab, but not the MP analog 1) confirms the highly reflective behavior of metals in the TIR, but 2) demonstrates that the reproducibility of downwelling atmospheric sky radiance is problematic in the laboratory. Natural surfaces appear to scatter the downwelling radiance, effectively attenuating the quartz signal. A maximum thickness of only 14µm of dust was sufficient to completely obscure reflective effects evident on the undusted, polished slab surface. It therefore requires approximately one order of magnitude less dust to obscure reflectivity spectra than emissivity spectra in the TIR as presented in [2].

References: [1] Schröder, C., et al. (2008), *JGR* 113, E06S22, doi:10.1029/2007JE002990. [2] Graff T.G. (2003) Master's Thesis, ASU. [3] Ashley J.W. et al. (2008) *LPSC* XXXIX, abstract #2382. [4] Connolly H.C. Jr. et al. (2006) Meteoritical Bulletin 90. [5] Morris R.V. et al. (2001b) *JGR*, 106, 5057-5083.