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Visible/NIR radiometric signatures of liquid water in Martian regolith simulant

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Water, especially in the liquid phase, plays an important role in the interpretation of Martian geology and is considered to be vital to the potential sustenance of biological processes on Mars. Because of the low surface temperatures and atmospheric pressures, liquid water commonly has been regarded as too unstable to exist on the Martian surface. However, dissolved salts can prolong the surface lifetime of liquid water, and thereby increase the probability of its existence, by considerably reducing both its freezing point and the vapor pressure [1]. Recent laboratory simulations confirm this [2], but identifying temporarily moist surface regions, if they exist, remains a challenge.

We seek to evaluate the possibility of remotely identifying surface moisture in soils by comparing laboratory reflectance measurements of dry and wet JSC-1 Martian regolith simulant [3]. Measurements are performed with the apparatus described in [4] using a variety of optical bandpass filters. The filters include five astronomical standards (Johnson and Kron/Cousins filters) and three edge filter combinations that are intended to approximate the HiRISE [5] filter set. Spectral characterizations and bidirectional reflectance distribution function measurements of the wet and dry samples in all bandpasses are presented, and the signatures of moisture in the regolith simulant are highlighted.

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