

Mineralogy of the Paso Robles soils on Mars

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ABSTRACT

Visible, near-infrared, thermal, and Mössbauer spectroscopic data from the exposed, bright track soil at the “Paso Robles” site within Gusev crater, Mars, indicate the presence of Fe³⁺-sulfates and possibly Fe³⁺-phosphates admixed with the host soil. When the spectroscopic analyses are combined with constraints imposed by chemical data, the determined dominant Fe³⁺-sulfate component is hydrous, and all of the spectroscopic methods suggest that it is probably ferricopiapite or some closely related, structurally similar species, possibly mixed with other Fe³⁺ sulfates such as butlerite or parabutlerite, or perhaps (para)coquimbite, fibroferrite, or metahohmanite. Such an assemblage is consistent with formation in a highly oxidized, relatively dehydrated environment with the bulk-sulfate assemblage having OH/(OH + 2SO₄) of < ~0.4. Some Fe³⁺ is likely to be associated with phosphates in the soil in the form of ferristrunzite or strengite.

Keywords: Mars, spectroscopy, sulfate, phosphate, mineralogy, spectra, Paso Robles, acid