In Brief: Martian soil oxidation-reduction potential not too extreme for life

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Ever since the NASA Viking mission, which reached Mars in 1976, there has been considerable interest in the composition of Martian soils.

Some Viking measurements indirectly suggested that the soils contained highly oxidizing compounds, which could present extremely harsh conditions for life.

Recent observations from the Phoenix Mars Mission pointed to evidence of perchlorate, a potentially highly oxidizing compound, in the Martian soils. However, some studies have noted that because perchlorate is highly stable, its presence in Martian soils cannot explain the Viking measurements.

Quinn et al. present a new analysis of Mars soil samples using the Wet Chemistry Laboratory, a component of the Microscopy, Electrochemistry, and Conductivity Analyzer on the NASA Mars Phoenix Lander. They find that although low levels of oxidizing compounds may be present, the oxidation-reduction potential of the soil is moderate and well within the range expected for habitable soils.

More information: Quinn, R. C., J. D. Chittenden, S. P. Kounaves, and M. H. Hecht (2011), The oxidation-reduction potential of aqueous soil solutions at the Mars Phoenix landing site, *Geophys. Res. Lett.*, 38, L14202, doi:10.1029/2011GL047671

Abstract

Results from the Mars Phoenix mission Wet Chemistry Laboratory (WCL) are used to determine the oxidation-reduction potential (Eh) of the Phoenix WCL Rosy Red sample soil solution. The measured Eh of the Rosy Red sample in the WCL aqueous test solution was 253 ± 6 mV at a pH of 7.7 ± 0.1. Measured solution Eh changes correspond to changes in solution H+ activity, which is controlled mainly by changes in headspace PCO2 and solution CO32−, HCO3−, and CO2 concentrations. If measured at a PCO2 of 8 mbar in water, rather than in WCL test solution, the Eh of the Rosy Red soil solution would be ~300 mV. The results of laboratory experiments using analog salt mixtures are compatible with the possible presence of low levels (ppm) of metal peroxides or other oxidants and indicate that levels of readily soluble ferrous iron in the soil are below 1 ppm.

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