

DETECTING ORGANIC COMPOUNDS RELEASED FROM IRON OXIDIZING BACTERIA USING SAMPLE ANALYSIS AT MARS (SAM) LIKE INSTRUMENT PROTOCOLS

D. P. Glavin¹, R. Popa², M. G. Martin¹, C. Freissinet¹, M. R. Fisk³, J. P. Dworkin¹, and P. R. Mahaffy¹

¹NASA Goddard Space Flight Center, Greenbelt MD, 20771, USA

²Department of Biology, Portland State University, Portland OR, 97207, USA

³Earth, Ocean and Atmospheric Sciences, Oregon State University, Corvallis OR, 97331, USA

Mars is a planet of great interest for Astrobiology since its past environmental conditions are thought to have been favourable for the emergence life. At present, the Red Planet is extremely cold and dry and the surface is exposed to intense UV and ionizing radiation, conditions generally considered to be incompatible with life as we know it on Earth. It was proposed that the shallow subsurface of Mars, where temperatures can be above freezing and liquid water can exist on rock surfaces, could harbor chemolithoautotrophic bacteria such as the iron oxidizing microorganism *Pseudomonas* sp. HerB [Popa *et al.* 2012]. The Mars Science Laboratory (MSL) mission will provide the next opportunity to carry out *in situ* measurements for organic compounds of possible biological origin on Mars. One instrument onboard MSL, called the Sample Analysis at Mars (SAM) instrument suite, will carry out a broad and sensitive search for organic compounds in surface samples using either high temperature pyrolysis or chemical extraction followed by gas chromatography mass spectrometry [Mahaffy *et al.* 2012].

We present gas chromatograph mass spectrometer (GC/MS) data on crushed olivine rock powders that have been inoculated with *Pseudomonas* sp. HerB at different concentrations ranging from $\sim 10^2$ to 10^7 cells per gram. The inoculated olivine samples were heated under helium carrier gas flow at 500°C and the pyrolysis products concentrated using a SAM-like hydrocarbon trap set at -20°C followed by trap heating and analysis by GC/MS. In addition, the samples were also extracted using a low temperature "one-pot" chemical extraction technique using *N*-methyl, *N*-(*tert*-butyldimethylsilyl) trifluoroacetamide (MTBSTFA) as the silylating agent prior to GC/MS analysis [Stalport *et al.* 2012]. We identified several aldehydes, thiols, and alkene nitriles after pyrolysis GC/MS analysis of the bacteria that were not found in the olivine control samples that had not been inoculated with bacteria. The distribution of pyrolysis products extracted from the bacteria was clearly distinct from similar GC/MS analyses of the carbonaceous meteorite Murchison that was dominated by sulfur containing aromatic compounds. A similar comparison, if organic compounds are detected by SAM on Mars, could be useful to help discriminate between meteoritic or biological origins. References: Popa, R. *et al.* (2012), Olivine-respiring bacteria isolated from the rock-ice interface in a lava-tube cave, a Mars analog environment. *Astrobiology* 12, 9-18; Mahaffy, P. R. *et al.* (2012), The Sample Analysis at Mars investigation and instrument suite. *Planet. Space Sci.*, doi: 10.1007/s11214-012-9879-z; Stalport, F. *et al.* (2012) The influence of mineralogy on recovering organic acids from Mars analogue materials using the "one-pot" derivatization experiment on the Sample Analysis at Mars (SAM) instrument suite. *Planet. Space Sci.*, doi:10.1016/j.pss.2012.02.010.