



SAM Sample preparation and its impact on the detection of organic compounds on Mars

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The wet chemistry experiments on the Sample Analysis at Mars (SAM) [1] experiment in the Curiosity rover of the Mars Science Laboratory mission supports extraction of polar organic compounds from solid samples that improves their detection either by increasing the release of chemical species from solid sample matrices, or by changing their chemical structure to make compounds more amenable to gas chromatography mass spectrometry (GCMS). The wet chemistry approach provides an alternative to the nominal inert-thermal desorption/pyrolysis analytical protocol used by SAM [1] that is more aptly suited for polar components. SAM, includes two different wet chemistry experiments: MTBSTFA derivatization [2-3] and TMAH thermochemolysis [4]. Here we report on the nature of the MTBSTFA derivatization experiment on SAM, the detection of MTBSTFA products in the SAM evolved gas analysis and GCMS experiments, and the implications of this detection.

Solid sample were heated up to approximately 840°C at a rate of 35°C/min under He flow. For GC analyses, the majority of the gas released was trapped on a hydrocarbon trap (Tenax®) over a specific temperature range. Adsorbed volatiles on the GC injection trap (IT) were then released into the GC column (CLP-MXT 30m x 0.25mm x 0.25μm) by rapidly heating the IT to 300°C. Then, in order better understand the part of compounds detected coming from internal reaction we have performed several lab experiments to mimic the SAM device. We have investigated the thermal degradation of Tenax®, and possible interaction with MTBSTFA and perchlorate in the SAM trap (Tenax®) to better constrain interpretations of SAM results on Mars.

References: [1] Mahaffy, P. et al. (2012) Space Sci Rev, 170, 401-478. [2] Buch, A. et al. (2009) J chrom. A, 43, 143-151. [3] Stalport, F. et al. (2012) Planet. Space Sci. 67: 1-13 [4] Geffroy-Rodier, C. et al. (2009) JAAP, 85, 454-459.

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