



Parameters for the Pyrolysis of Organic Material - Perchlorate Mixtures

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The ESA-lead Mars rover ExoMars (launch in 2018) will carry a suit of instruments, one of the instruments is the Mars Organic Molecule Analyzer MOMA. Organic material in the Martian soil will be either pyrolyzed at temperatures of up to 1000°C and separated by gas chromatography or volatilized with the help of an UV-laser. A mass spectrometer will be the detector for both methods.

Chlorinated organics have been detected in pyrolysis GC-MS experiments on Mars two times. The first time during the Viking mission in 1976 and a second time with the Sample Analysis on Mars (SAM) instrument onboard the Curiosity rover in 2012. [1] [2]

The presence of perchlorates found by the Phoenix mission in 2008 [3] lead to the discovery that organic molecules not only get oxidized during pyrolysis, but also chlorinated organic compounds can be produced. [4]

The parameters used for pyrolysis and the sample composition especially the distribution of organics and perchlorates within the sample and the concentrations of organics and perchlorate have a huge influence on the products created. It is possible to change the conditions of the pyrolysis by spatially separating the organics from the perchlorates that the chloromethanes get the major product of the pyrolysis. This might help to understand the results of the (SAM) instrument yielding mono-, di- and trichloromethane and a chlorinated 4-hydrocarbon molecule.

References:

- [1] Biemann K et al. (1977) JGR, 82, 4641–4658. [2] Grotzinger J. P et al. (2011) AGU Fall Meeting U13A-01
[3] Hecht M. H., et al. (2009) Science, 325 64-67. [4] Steininger H., Goesmann F., Goetz W. (2011) Planet. & Space Sci., 71, 9-17.

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