

WET CHEMISTRY EXPERIMENT AT MARS (WETCHEM)

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NASA is currently developing strategies for several in-situ missions to Mars during the coming decades to explore and quantitatively assess the potential habitability of the Martian surface. Some of these missions will be designed to specifically search for biosignatures. In order to analyze inorganic and organic compounds from surface and sub-surface samples, and to search for biosignatures, we propose a novel experimental approach utilizing wet chemistry combined with mass spectroscopy called “Wet Chemistry Experiment at Mars (WetChem)”. WetChem consists of an integrated suite of miniature instruments: a Robotic Chemical Analysis Laboratory (RCAL), and an Electrospray Ionization/Ion Mobility spectrometer (ESI/IMS) in tandem with a Cylindrical Ion Trap Mass Spectrometer (CIT-MS). Fig.1 summarizes WetChem’s science and measurement objectives.

RCAL is designed to provide information about the aqueous chemistry and soluble minerals present in the Martian soil using an array of electrochemically-based sensors. The sensor array consists mainly of potentiometric ion selective electrodes but also includes conductivity, and voltammetric microelectrodes for determination of heavy metals. In addition, RCAL will serve as the front-end instrument to extract volatiles, inorganic and organic compounds from the Martian regolith and feed them to the ESI unit for further analysis by IMS/CIT-MS. Via the MS we will be able to conduct a survey for a broad variety of organic molecules, enabling the identification of potential chemical biosignatures (i.e. amino acids, carboxylic acid). Mass spectrometric methods will also be used for chiral amino acid analysis.

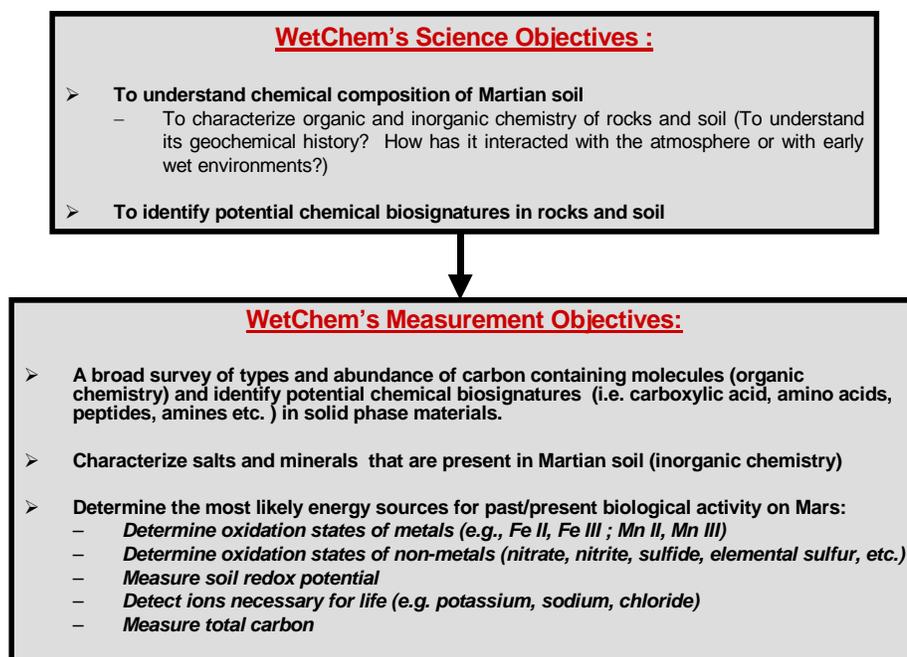


Fig. 1 Summary of WetChem’s science and measurement objectives.