An RF-powered micro-extractor for the detection of astrobiological target molecules. V. J. Scott,[1,2] X. Amashukeli, [1,2] P. H. Siegel, [1,2] A. Fisher, [1,2] Y. Bae, [1,2] R. Toda[1,2], [1]Jet Propulsion Laboratory, Pasadena, CA, United States, [2]California Institute of Technology, Pasadena, CA, United States.

Introduction: Major goals of space exploration are to look for extant or extinct life (i.e. chemical biomarker molecules) and to determine the factors that make an environment habitable; an extension of this goal is to better understand prebiotic chemistry and the features that allow life to occur.[1] In situ detection remains the most widely used method in missions that address these questions. Missions to astrobiological or geochemical planetary targets will require an efficient and non-altering extraction technique for efficient detection and characterization of biomarkers. Two new instruments are described that have been developed for use in the exploration of Mars — a target that attracts considerable attention from the astrobiology community; however it will be applicable to any mission requiring in situ analysis of planetary regolith and ice. The first of these instruments is a micro-extractor (μEX) that exploits the unique property of water to modify its dielectric constant when affected by radio-frequency (RF) radiation;[2, 3] the second is a smaller version of the Sub-Critical Water Extractor [4, 5] (Micro-scale Ion Analyzer, or MIA). These instruments are first tested on stock solutions of potential biomarkers to monitor and chemical changes and demonstrate some bond breaking capabilities, then on various planetary-analog samples for extraction. The best protocols for extraction of various bio-markers will be determined while maximizing efficiencies and minimizing the degradation of the targets and appropriate detection methods for each will be examined.

References:

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