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MARS ORGANIC MOLECULE ANALYZER (MOMA): INSTRUMENT CONCEPT AND RESULTS

Abstract

The Mars Organic Molecule Analyzer (MOMA) is a powerful multi-source mass spectrometer-based instrument suite for investigation of potential life on Mars. MOMA has been selected as a core element of the Pasteur payload on the ESA ExoMars mission that will launch in 2018. The MOMA instrument is the next generation design for in situ life detection instrumentation. The MOMA suite includes a gas chromatograph (GC) and a 266 nm Nd:Yag laser (LD) allowing for several methods of volatilizing and ionizing carbon-based compounds from 'intact' powdered core samples. By using both GC and LD, MOMA is able to survey several classes of organics (e.g. amino acids, polycyclic aromatic hydrocarbons, small peptides) over a broad mass range (10 - 2000 amu) with little or no sample manipulation. Both the LD and GC share an ion-trap mass spectrometer (ITMS). The ITMS provides enhanced mass resolution and can further provide detailed structural information on specific (single mass) organic molecules (e.g. MS/MS), allowing MOMA to determine the 'origin' (abiotic or biotic) of the organic matter detected on Mars. In this paper, we present our current MOMA-LDMS prototype design and some preliminary results including several Martian "analogue" samples.