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Detection of Organic Compounds in Polar Ices Using AP MALDI

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We present here a novel instrument for the detection of biological compounds (amino acids, bases, peptides) at ambient pressure in polar ices. A new sample ionization technique, atmospheric pressure matrix-assisted laser desorption/ionization (AP MALDI), has been coupled with a commercial ion mass spectrometer. This configuration enables the application-specific selection of external atmospheric ionization sources (e.g. electrospray, commercially available) and AP MALDI (built in house). The detection limit of the novel AP MALDI/ion trap is 10-50 femptomole (fmol) of analyte deposited on the target surface for a four-component mixture of peptides at 800-1700 molecular weight. AP MALDI can also be operated in situ and spectra obtained directly off the surfaces of mineral grains, ices, and liquid samples at ambient Martian conditions. The ability to detect biologically relevant molecules directly from the surface of the ice matrix allows for the assessment of a variety of environments that may be encountered on Mars.