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Analysis of Aqueous Environments by the Mars Organic Molecule Analyzer (MOMA)

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The Mars Organic Molecule Analyzer (MOMA) investigation, a joint development by partners in Germany, France, and the U.S., is a key analytical instrument featuring pyrolysis gas chromatography mass spectrometry (GCMS) and laser desorption mass spectrometry (LDMS) on the ExoMars rover *Rosalind Franklin* launching in September 2022. MOMA will analyze crushed rock samples, collected from the subsurface of Mars, for potential molecular signs of past or present life. As on other planetary bodies, the presence of water on Mars is important for understanding the habitability of the environment. Diagnostic chemical and mineralogical sample composition can reveal aqueous processes that may have persisted on ancient Mars and are therefore of high astrobiological interest. The intended landing site of ExoMars in Oxia Planum exhibits pervasive clay mineral signatures that suggest this region hosted longstanding surface water in the late Noachian. Here we present LDMS mode mass spectrometric results on *Oxia* analogs from the MOMA engineering test unit (ETU). Phyllosilicates such as vermiculite, kaolinite, montmorillonite, and nontronite; sulfate minerals such as gypsum, epsomite, and melanterite; and mixed field samples from relevant analog sites on Earth were tested to provide baseline spectral data on matrix minerals that may preserve organic compounds. The results demonstrate both the potential of the MOMA instrument to support identification of minerals, as well as the challenges of data analysis and deconvolution of complex resultant spectra.