**SAM GCMS Calibrations for Identification of Organics on Mars**

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**Introduction:**

**Goal:** To calibrate the relative retention times of expected Mars analyte components to SAM internal standards.

**Abstract:** Sample Analysis at Mars (SAM) is located on the Curiosity Rover that will land on Mars on August 5, 2012. SAM contains a Gas Chromatograph Mass Spectrometer (GCMS), which will be used by scientists to identify organic molecules if present on Mars. Organic molecules will be identified based on mass spectra and GC retention time (i.e., amount of time it takes for a molecule to pass through the GC column). SAM will use its internal standards as markers for retention times. We analyzed mixtures of organic molecules and calibrated the retention times of the analyte components to SAM internal standards. The relative retention time between the sample mixture components and the internal standards act as identification markers. These relative retention time markers will be used during SAM operations to help identify if and what organics are present on Mars.

**Materials & Methods:**

**Pyrolyzer:** A sample is placed in a stainless steel cup in the Pyrolyzer. In the Pyrolyzer, the cup drops into a heated zone. The temperature is then ramped to 1000°C. Gas evolved from the heated sample exits the Pyrolyzer and enters the cool (10°C) Gas Chromatograph (GC) Mass Spectrometer (GCMS): Gas Chromatograph

The molecules of the evolved gas move through the GC column at speeds based on the properties of the molecules, molecular interactions with the column film, and the temperature of the oven. The oven is ramped from 10°C to 300°C at different rates (3, 6, & 10 °C/min), similar to the range SAM might use on Mars. As the molecules move through the column, they become separated and reach the Mass Spectrometer (MS) at different times.

SAM contains 4 columns designed for different types of molecules. The RTX-5 Column used here is appropriate for non-polar to slightly polar hydrocarbons. Gas Chromatograph

The MS produces electrons and directs them towards the incoming molecules. The molecules are then ionized and directed towards a detector. The data from the sample collected consists of a chromatogram showing peak relative abundance and retention time as well as associated mass spectra for each peak.

**Data:**

The relative retention times in the charts displayed below, are ratios of where on the chromatogram a specific organic will be. No two columns are the same; therefore for example, Phenanthrene will not come off the column at an absolute time, every time when two different columns are used. Thus, calculating relative retention times to internal standards allows the identification of organics by retention time to be standardized to any column used.

**Conclusion:** Calculating the relative retention times of known, common organic molecules to the SAM internal standards will be used to verify the presence or absence of certain molecules and will help in the identification of other organic molecules encountered on Mars.

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