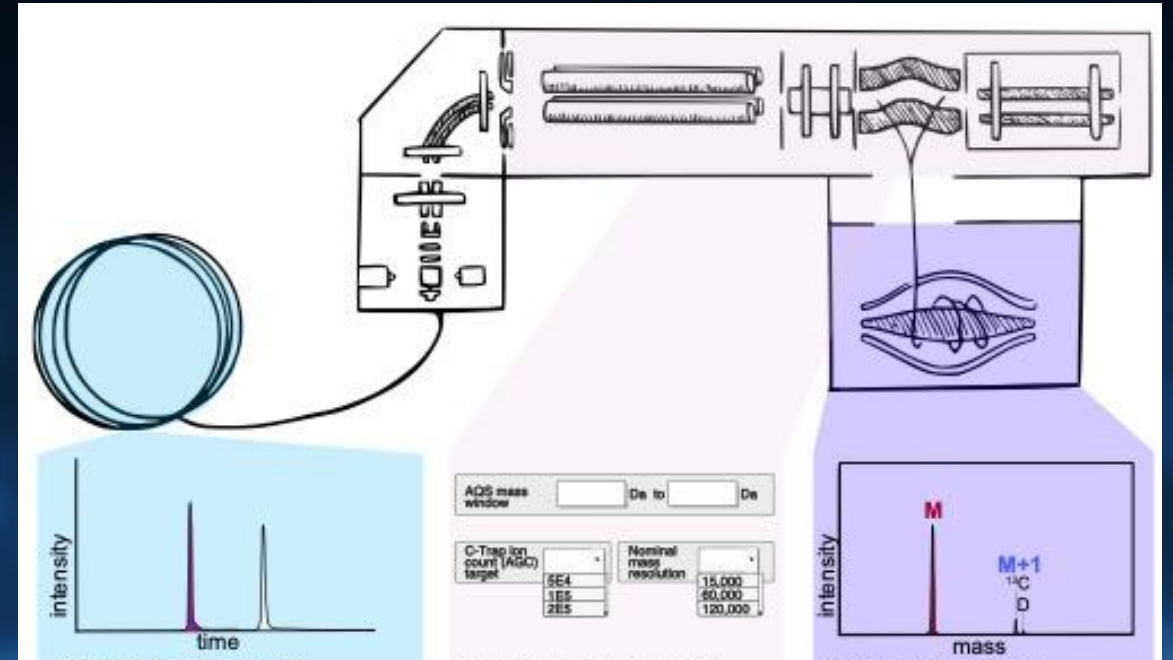


Method for high-precision intramolecular isotope analyses of meteorite organics

The extremely high resolution of Orbitrap-based mass spectrometry enables direct measurements of the intramolecular stable C, H, O, and N isotopic compositions of extraterrestrial organic molecules.

- Stable isotope ratios of natural samples are used to characterize chemical synthesis processes, environmental conditions, and elemental budgets in natural cycles, and can be quantified at levels of natural abundance via mass spectrometry.
- A recent study asked, “Can we simultaneously make singly, multiply, and site-specific isotope ratio measurements on gas chromatograph (GC)-separated analytes within a single acquisition?”
- The team of researchers developed analytical methods and models, tested these on multiple types of organic analytes, and demonstrated their ability to retrieve high-precision, intramolecular isotopic data.
- The research showed that multiply-substituted and site-specific isotopic compositions of organic molecules with large isotopic anomalies (e.g., extraterrestrial organics) can be measured to high-precision via this approach. This analytical method simplifies and streamlines measurements of meteoritic organics and is currently being implemented in analyses of organic molecules from other carbonaceous meteorites and Ryugu.



Direct Injection & Elution + Optimization Isotopologue Separation