

Environment

- * Measuring all green house gases simultaneously in real time
- * Complex samples from air, soil, and water

Energy

- * Hydrogen and Helium isotopic differentiation
- * Chemical differentiation of petroleum and derivatives
- * Characterize combustion efficiency and byproducts

Pharmaceutical

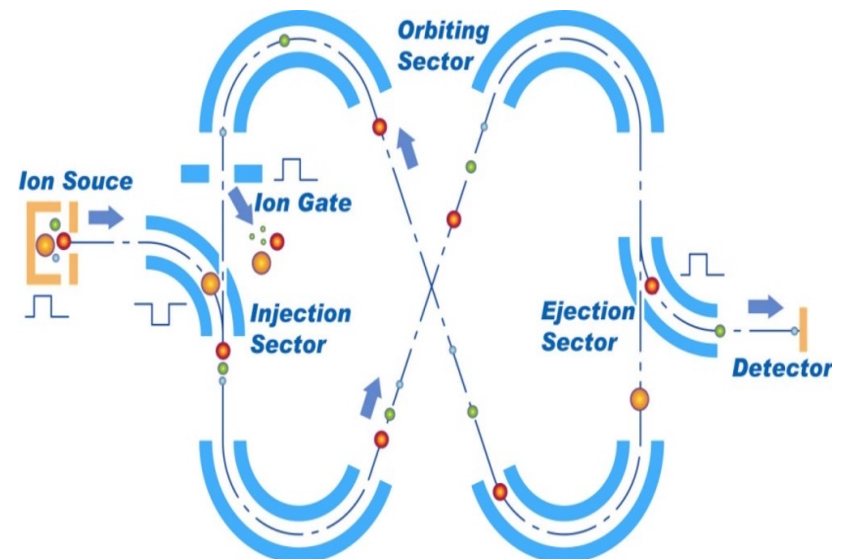
- * Measure active/inactive ingredients in complex formulations
- * Identify and quantify cannabinoids of interest

High Purity Process Gases

- * Specialty Gases for Semiconductor / and other areas

INFITOF Multi-turn Time-of-flight MS

- Highest resolution with the smallest footprint
- Readily optimize sensitivity and resolution for any case
- Combine with GC or TGA to analyze complex samples
- Resolution: >30,000 (FWHM @m/z 28)
- Mass range: m/z 0.8-1,000 - Ionization: EI





Environment

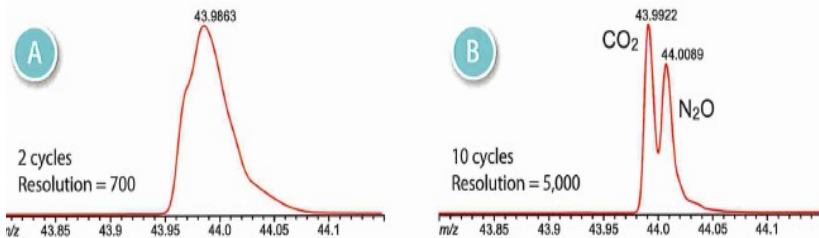
- Measure all green-house gases with high resolution in real time ($\text{CO}_2/\text{N}_2\text{O}$). Only one instrument is required to measure all greenhouse gases.

Example

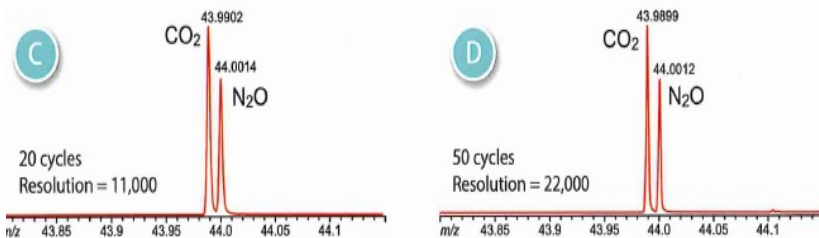
- Increasing the number of cycles through the InfiTOF achieves resolution well beyond QMS or lower resolution TOF instruments.

Typical QMS Resolution

Standard TOF Results



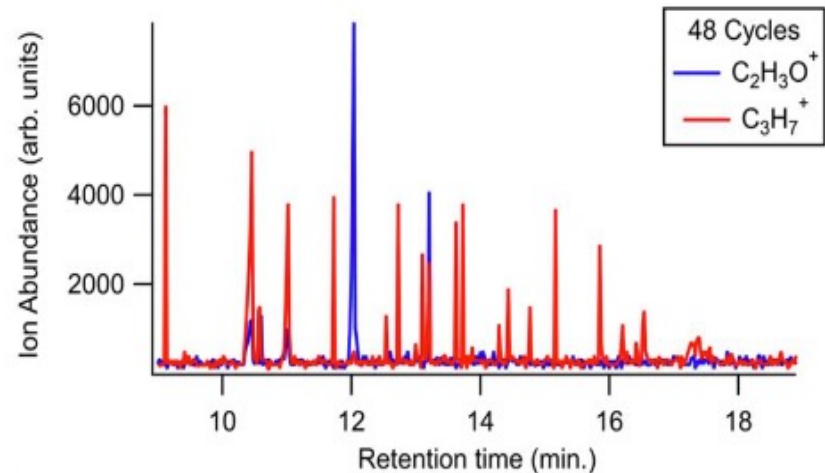
Typical InfiTOF Resolutions



- Analysis of complex samples from air/soil/water

Example

- Aerosol sample, mixture of organic molecules present in atmospheric conditions ($\text{C}_2\text{H}_3\text{O}$ and C_3H_7 are Acetyl and Isopropyl fragments).
- Data shown is pre-separated via GC.
- Advantage over standard to high-end TOF systems (2k – 8K). InfiTOF has a maximum limit of 30k-but much more cost effective.



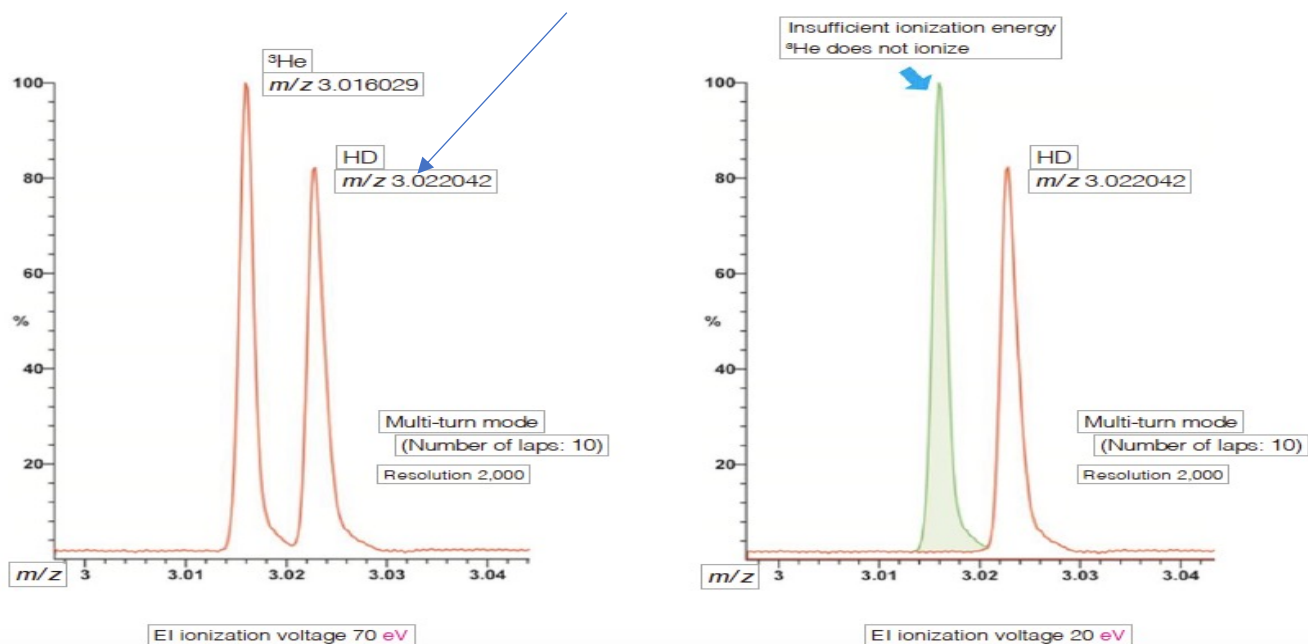


Energy

- Hydrogen and Helium isotopic differentiation
- Chemical differentiation of petroleum and derivatives
- Characterize combustion efficiency and byproducts.

Example

- Helium-3 (^3He) is an isotope that exists in the atmosphere at only one millionth of helium-4 (^4He), and is used in nuclear fusion research and neutron detection. Hydrogen Deuterium (HD) is $^1\text{H} + ^2\text{H}$. The example below shows that HD can be distinctly separated from ^3He by the InfiTOF.



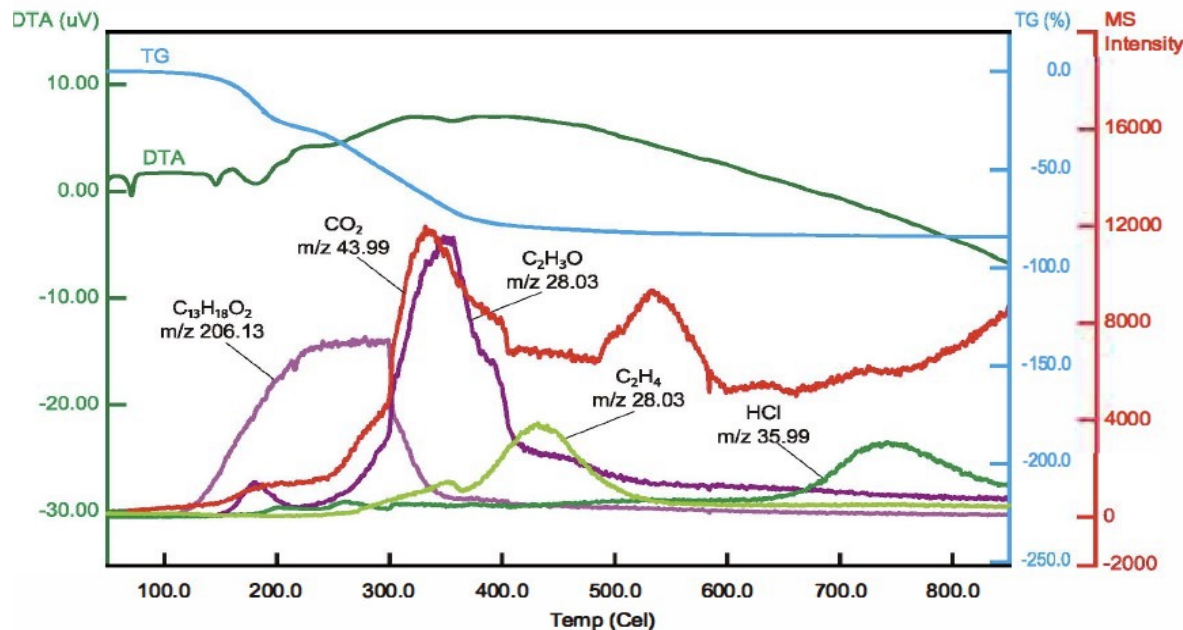


Pharmaceutical

- Measure active/inactive ingredients in complex formulations
- Identify and quantify cannabinoids of interest
- Other

Example

- TG/DTA analysis is used to confirm the thermal stability of the pharmaceuticals for safety reasons, and also as a qualitative analysis of the generated components. The below illustration shows how the InfiTOF can be used to confirm the presence and quantity of Caffeine ($C^8H^{10}N^4O^2$)--identified by fragments at (55,82,108,and 194) and Ibuprofen ($C^{13}H^{18}O_2$).



High Purity Process Gases (Semiconductor, other)

- Quality control for high purity gas providers used in semiconductor production, and other applications.
- Real-time 24/7 monitoring system.
- Advantages over Cavity Ring Down (CRDS) systems which require a unique laser / molecule. InfiTOF has super high resolution across a large mass range to detect any contamination that is present.

Example

- Silane (SiH_4) is used for polycrystalline deposition of interconnects or masking growth of epitaxial silicon. The InfiTOF detects Silane as a combination of SiH_3 and SiH_2 . With lower resolution TOF, both SiH_3 and SiH_2 would not separate Silane from the contaminants. Ideally only N_2 and $\text{SiH}_2/\text{SiH}_3$ should be present, but the higher resolution of the InfiTOF reveals many other contaminants (shown in pink).

