Aerosol Mass Spectrometer (AMS)

A High-Resolution Instrument for Real-Time Aerosol Chemical Characterization

INTRODUCTION:

The Aerosol Mass Spectrometer (AMS) is a time-of-flight-based, state-of-the-art instrument designed for real-time quantitative and qualitative analysis of aerosol particles. AMS is widely used for measuring the chemical composition of non-refractory submicron aerosols including organics, sulphates, nitrates, ammonium, and chlorides. It plays a vital role in air quality studies, climate research, and understanding aerosol-cloud interactions.

OBJECTIVES:

- Accurate detection and quantification of black carbon particles
- Real-time analysis of particle size, mass, and number concentration
- Assessment of mixing state (coated vs uncoated BC)
- Support for climate change studies, aerosol-cloud interactions, and source apportionment

KEY SPECIFICATIONS:

- Size Range: 80 - 1000 nm aerodynamic diameter
- Resolution: High-Resolution Time-of-Flight (HR-ToF)
- Detection Method: Electron Impact Ionization (EI)
- Instrument Modes: V-mode and W-mode (high-resolution mode)
- Mass Accuracy: ~0.002 amu (W-mode)
- Vacuum System: Triple-stage vacuum system

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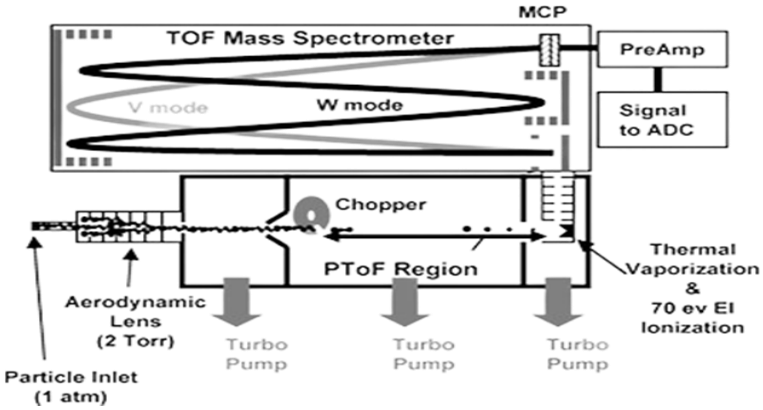
DATA OUTPUT:

- Mass concentration of individual chemical species
- Aerosol size distribution (80 - 1000 nm)
- Time-resolved particle composition
- Ion signal vs. mass-to-charge ratio (m/z)

MEASUREMENT & WORKING PRINCIPLE:

Aerosols are sampled through an aerodynamic lens system into a high-vacuum chamber, where they impact a heated vaporizer. The resulting vapours are ionized by electron impact and analysed using a Time-of-Flight Mass Spectrometer. The AMS measures mass spectra in real-time, allowing for detailed characterization of non-refractory aerosol composition.



KEY FEATURES:

- Real-time high-resolution aerosol analysis
- Accurate identification of organic and inorganic components
- Minimal sample preparation required
- Well-suited for ambient and laboratory applications
- Used in field campaigns, mobile labs, and long-term air monitoring stations