

Quadrupole Mass Spectrometry

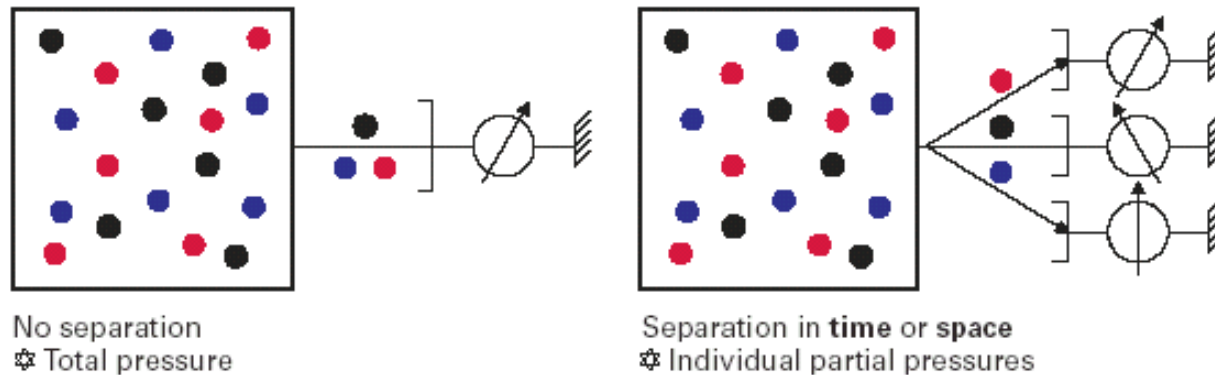
- Basics of Quadrupole Mass Spectrometry
 - Ionization
 - Mass separation
 - Detection
- Working at different pressures
- Software



Total and Partial Pressure

Mass and Charge

- The total pressure is the sum of all pressures of a given gas mixture
- To determine the partial pressure of a certain gas component, this component must be isolated from the mixture
 - ✦ Thus prior separation of the gas mixture is necessary
- This takes place according to the ratio of mass to charge: m/e



Total and Partial Pressure

Partial Pressure Analysis informs on

- **residual gasses at base pressure**
- **air leaks**
- **Helium leaks (leaktest)**
- **composition of process**
- **impurities in process gases**

MS basics

➤ **What does a mass spectrometer do?**

A mass spectrometer produces charged particles (ions) from the chemical substances that are to be analyzed. The mass spectrometer then uses electric and/or magnetic fields to measure the mass ("weight", or more precisely the Mass/charge ratio, m/z or m/e) of the charged particles.

MS basics

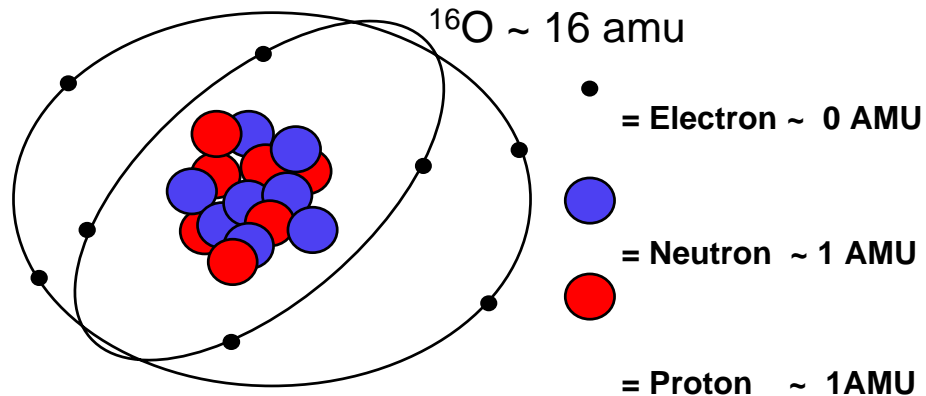
➤ What does the mass tell us?

Let us use water (H₂O) as an example. A water molecule consists of two hydrogen's (H) and one oxygen (O). The total mass of a water molecule is the sum of the mass of two hydrogen's (approximately 1 atomic mass unit per hydrogen) and one oxygen (approximately 16 atomic mass units per oxygen):

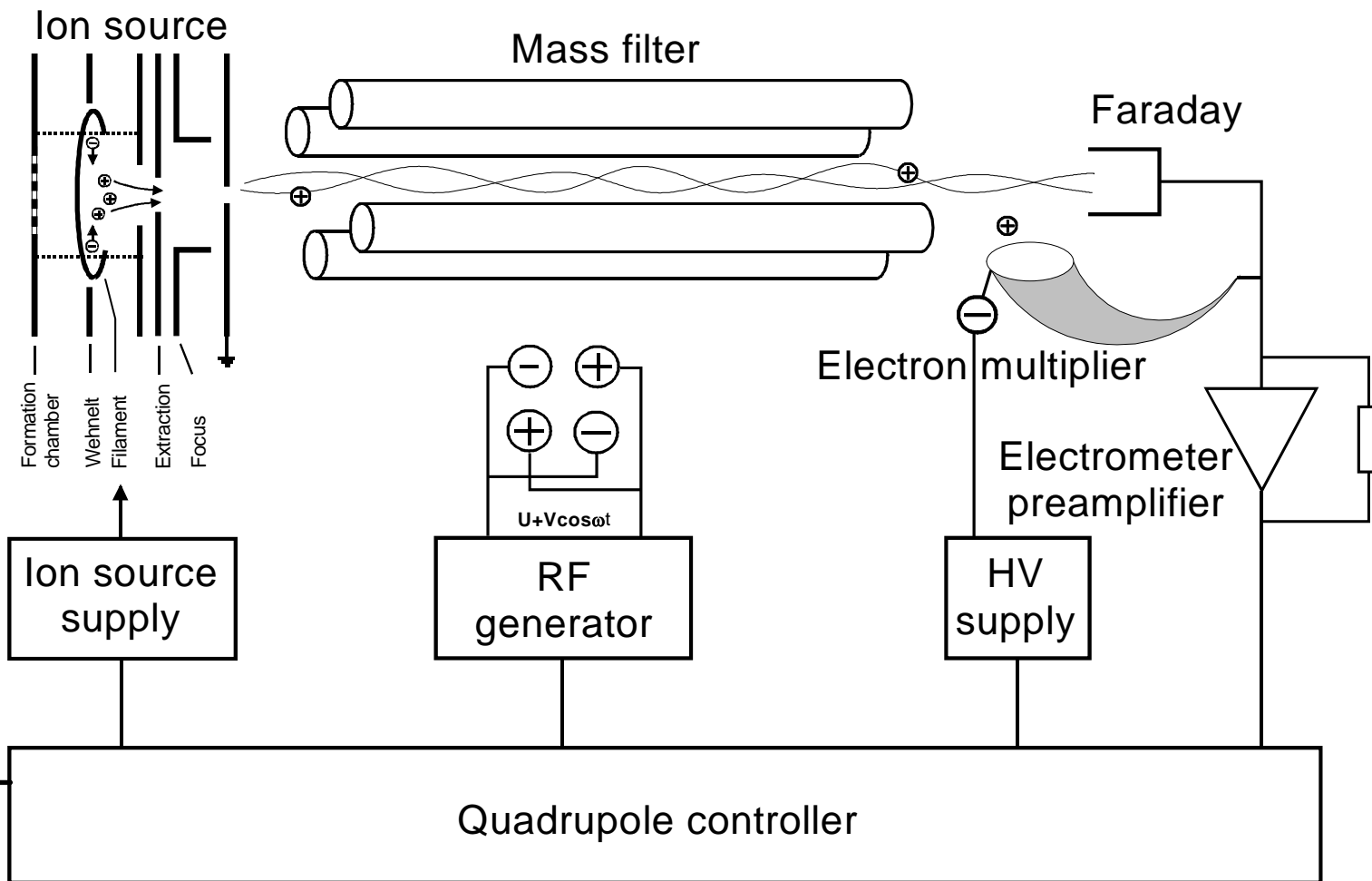
2 H: 2 amu (atomic mass units)

+ O: 16 amu

= H₂O: 18 amu



MS instrument set up



MS basics

➤ General

To ensure filament longevity, ion mobility and detector operation the analyzer has to be kept under high vacuum conditions.

- At high pressure filaments burn quickly
- At high pressure Secondary Electron Multipliers degrade quickly

MS basics

Why is it necessary to work under vacuum?

