

Gas Chromatography_ Mass Spectroscopy GC MS

A typical GC-MS
Minimum \$80,000

Can analyse materials which
vaporise completely at approx
250°C

The actual column is 5 microns
thick and 30m long. The sample
is cycled through heating and
cooling. The higher the volatility
the quicker the material passes
through. This device cannot
handle high mass molecules
which char and form solids on
heating (some sugars proteins etc)



100 samples can be processed automatically. Most feature powerful
software which contains a library of some 250,000 materials.



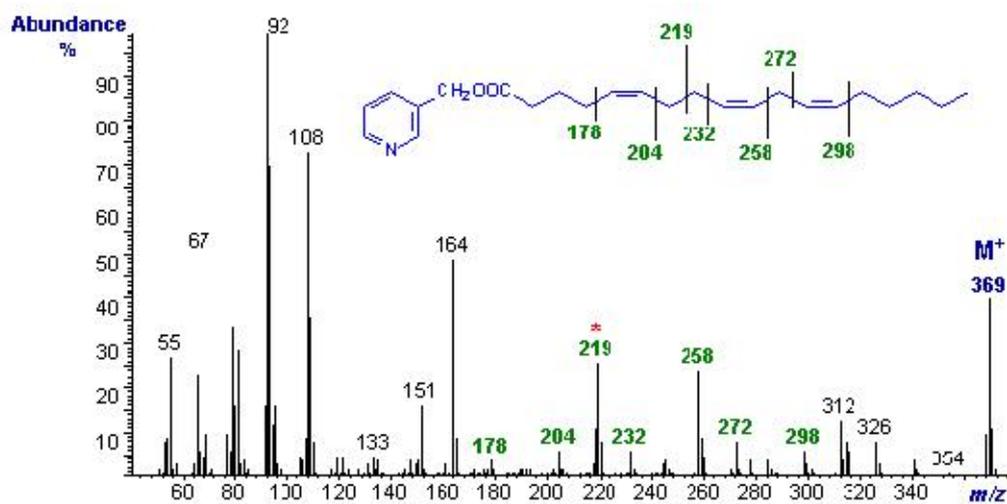
The internal column (capillary)

The mass spectrometer accepts the exit vapour. An electron gun
fires electrons at the gas molecules and splits into various sized
fragments. The largest of which is the molecular ion. (i.e. the whole
molecule minus one electron) this always shows up as the final peak
on the mass spectrum

Following ionisation the positively charged particles are accelerated by an electric field. The various size particles are deflected to varying extents by a changing magnetic field. Particles are detected and the electrical signalled usually amplified before the output is processed by computer software.

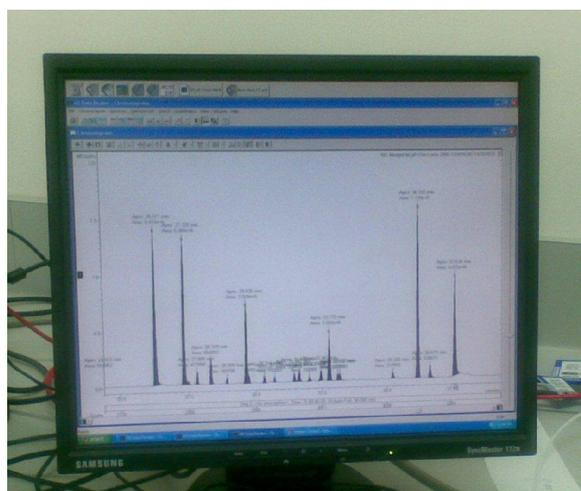
These devices are very sensitive and can detect extremely low concentrations (nano moles)

Typical mass spectrum below



Notice the molecular ion.

A standard quantity of a known compound is often mixed in with the material under test. A single peak developed can be used to establish the relative concentrations of the fragments present. The computer software will normally set the highest peak at 100% abundance



mass spectrum display

Liquid Chromatography with UV spectrometer

A typical device minimum \$60,000



LC-UVS

By contrast the separating column here is very short (approx 8cm) It is packed with tiny solid particles which resemble tiny tennis balls. The column is the heart of the device and very expensive. A trap is placed in front of this to prevent solids blocking the flow of solvent.

A mix of solvents is automatically varied as the sample is being processed. Initially delivering a polar solvent this is diluted with organic non polar solvents. This process is assisted by the high pressure pump (ticking away) in the background. This operates at over 600psi

Materials most soluble in the sample pass through first. (eg water soluble salts)

The materials are analysed by their ability to absorb both visible and ultra violet light. Two dimensional spectrums are produced. This version of the software does not contain any built in library.

The materials under test should be soluble in the solvents used. Ideally they should not contain any fine solids. Caffeine tests can cause problems because coffee usually contains fine particles of solid