smiths detection

Ion Mobility Spectrometry

AN ATMOSPHERIC PRESSURE CHEMICAL DETECTION TECHNOLOGY

www.smithsdetection.com

Ion Mobility Spectrometry is the science behind our world-leading range of chemical agent detectors and explosives detectors.

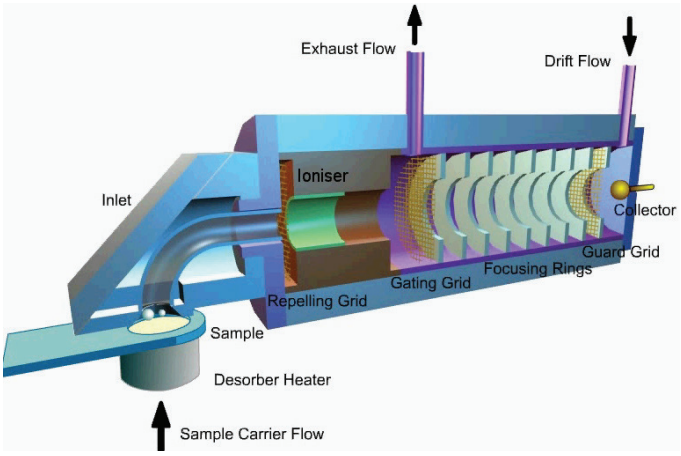
Ion Mobility Spectrometry (IMS) is an atmospheric pressure chemical detection technology that is, in many ways, similar to Time-of-Flight Mass Spectrometry. IMS provides an unrivalled combination of detection features:

- Sensitivity (ppb)
- Fast response (a few seconds)
- Small size (wearable, handheld)
- Low power (~ 4 x AA batteries)
- Low cost

Through this powerful combination of features, IMS based systems have found extensive use in many diverse areas, from common applications such as detection and monitoring of chemical warfare agents (CWAs) and toxic industrial chemicals (TICs) in the military arena or detection of explosive traces on luggage in airports, to monitoring the atmosphere inside the International Space Station (ISS).

Principle of Operation

A schematic diagram of a typical Ion Mobility Spectrometer is shown below.



Samples need to be in vapour phase for detection in an IMS system. Vapour samples are analysed directly by drawing in sample flows containing the analyte of interest – CWA's, TICs and some volatile explosives are detected in this way. Some samples, such as involatile explosives and many narcotic compounds, need to be heated to create enough vapour for detection. In this latter case, sample material released by thermal desorption is swept into the reaction region of the detector, usually by a small gas flow.

IMS uses soft ionization techniques, such as 63Ni or corona discharge, to form reactant ion species from the carrier gas employed in the system, normally air. Mixing these stable reactant ion clusters with vapour samples to be analysed can result in ionisation of the sampled materials, thus forming ion clusters characteristic of the sample material. This ionisation process is generally referred to as Atmospheric Pressure Chemical Ionization (APCI).

A small packet of the ions so formed is injected electrically into a drift region, where they pass to a collector electrode some distance away (typically a few cm) under the influence of an applied electrostatic field. Ions travel through the drift region at characteristic speeds that are related to the size and shape of the ion clusters.

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