

Mass Spectrometry & Spectroscopy

Determining Hazardous Substances at Arm's Length

Metrohm AG

The police, military, fire service, and rescue services are frequently faced with situations where they encounter unknown substances: a secret laboratory, a leak in a tanker, or the discovery of an unidentified powder. Rapid identification of the substance is essential to making a decision on how to proceed. Yet to do this, contact with the substance must be avoided as far as possible, as under these circumstances, an unknown substance could potentially be a hazardous substance.

Raman spectroscopy can solve this problem: A laser beam is directed at the substance to be determined. The light interacts with the substance and is modified in a unique way. Analysing the scattered light enables the substance to be uniquely determined. This all happens in a matter of seconds.

New Raman spectrometer for defence and security applications

The Mira DS a new Raman handheld spectrometer especially for the defence and security sector. Hardly any bigger than a smartphone and equipped with a practical touchscreen, it is easy to operate with one hand – even when wearing gloves. This enables, for example, drug squad officers, explosives experts, and the military to identify illegal substances and explosives in a matter of seconds directly on site.

The spectrometer even identifies substances through transparent packaging such as plastic bags or glass bottles. With its certification to IP67 and in accordance with US military standard MIL-STD-810G, it is also particularly robust and suitable for use in dangerous environments.

Equipped for all samples

The Mira DS identifies substances by comparing the measured spectra with its integrated spectral database. This includes the spectra of thousands of substances, including drugs, explosives, and other hazardous substances. Five measuring attachments, which can be exchanged in just a few steps, make the instrument particularly flexible: depending on the sample, the right attachment can be mounted to ensure optimum measurement. The universal attachment and the right-angle attachment (Figure 1) are included with the Mira DS as standard. All other attachments can be purchased additionally as required.

Safety on the streets and in the laboratory

There are situations where a protective suit and keeping at arm's length are not enough to guarantee safety. This is the case, for example, when suspected explosives are found. To analyse such substances, the strength of the laser can be reduced to prevent detonation. The possibility to set a scan delay gives the user enough time to position the Mira DS and get out of the hazardous area before the sample is measured. Thanks to the interface with the HazMasterG3 app, further information about the substance can be called up on a smartphone once it has been identified.

The identification of potential hazardous substances on site by means of Raman spectroscopy also means greater safety for employees in forensic laboratories. Handling unknown substances is an extremely delicate matter. If the substance has already been identified using Raman spectroscopy, this makes it easier to ensure that the sample is handled correctly during the wet chemical analysis to determine its exact composition.

Identification of blended and trace substances

The identification of street drugs is made more difficult by the fact they hardly ever appear in their pure form. The cuts can contain a whole host of different substances. This has an effect on the Raman spectrum, which is a superposition of the spectra of all of the substances contained in the mixture. With the aid of Orbital Raster Scanning (ORS) and the latest software, Mira DS identifies the individual components of such mixtures.

If only very small amounts of a suspicious substance are present, the measuring sensitivity can be increased by means of Surface Enhanced Raman Scattering (SERS) in such a way that even traces can be reliably determined. The SERS substrate kits needed for this are available directly from Metrohm.



Figure 1. The right-angle attachment enables measurements to be conducted on surfaces.

Versatile use

The Mira DS is handy, highly robust, and with its extensive spectral database, is able to detect thousands of substances. It is therefore ideally equipped for all conceivable applications – from routine security checks at airports to serious cases encountered by the police, drug squad, and rescue services.



Figure 2. With the ball probe attachment, substances can be measured in direct contact with the probe, meaning that the user no longer has to maintain a certain distance.



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