

A Miniature, Deployable Mass Spectrometer for Direct Analysis of Aromatic VOCs in Essential Oils.

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The development of portable analytical tools, including mass spectrometers, has advanced rapidly in recent years. Small instruments are now commercially available for analytical applications in various fields. However, to achieve portability, some mass spectrometry (MS) performance characteristics—such as resolution, sensitivity, or the ability to operate in MS/MS mode—are often compromised.

An innovative field-deployable MS (MTE30, MassTech Inc., Columbia) equipped with an atmospheric-pressure interface has been coupled with a ring-shaped cold plasma ion source (SICRIT, Plasmion, Augsburg) and a Solid-Phase Microextraction (SPME) sampler. The instrument is fully integrated into a single chassis, requires no external pumps or gases, weighs approximately 17 kg, and provides better-than-unit mass resolution over a 2000 Da range. MS/MS acquisitions are also possible, enhancing instrumental specificity for complex samples.

This study demonstrates the direct analysis of aromatic VOCs in essential oils. Eleven essential oil samples—five lavender oils, five rosemary oils, and one chamomile oil—were analyzed in approximately five minutes, revealing differences in both composition and relative signal intensities. Classification of the oils can be achieved through chemometric approaches following appropriate model training.

Finally, the SICRIT ion source (Soft Ionization by Chemical Reaction In Transfer) is a general-purpose ion source that can also be installed on conventional laboratory-grade LC/MS instruments to perform direct analysis or GC analysis of VOCs when higher sensitivity or specificity is required. The SPME capability also enables trace and ultra-trace odorant VOC analysis in air samples.