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Examples of the use of a true mobile mass spectrometer for on-site analysis

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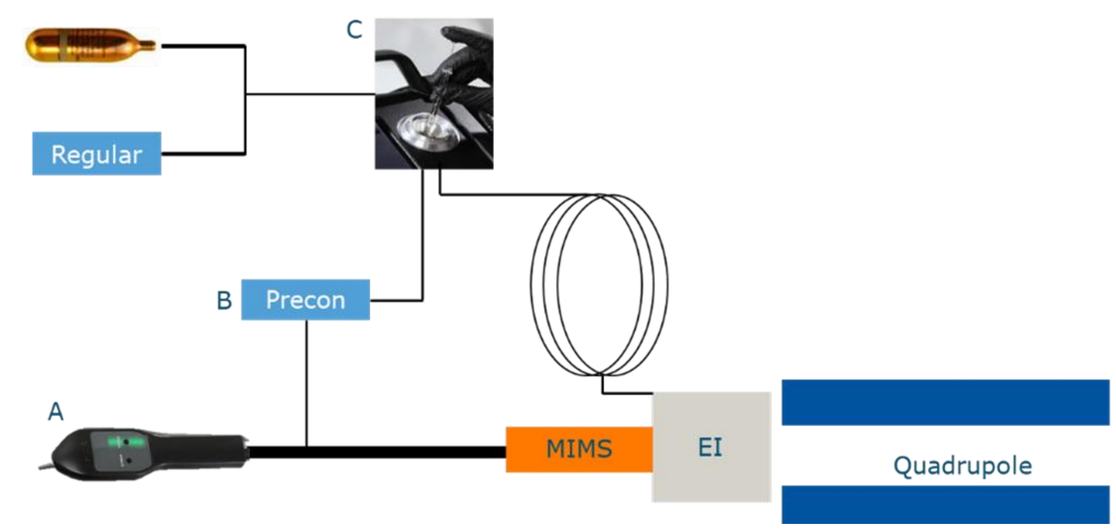
Introduction

Nowadays, we use optical sensors in our smartphones and smartwatches to measure all kind of mostly health-related parameters. Unfortunately, their application is limited. Imagine the possibilities if you could take high-end laboratory equipment to the field. Current mass spectrometers are, at best transportable, not truly portable. What if you could fit an MS in a small backpack or carry it in your hand? In recent years, we have invested in research, leading to effective on-site MS.

A portable gas chromatography-mass spectrometer, Griffin 510 instrument (Flir, Wilsonville, OR, USA), has been used in this study. This Portable GC-MS is fully battery-operated, consisting of a split-splitless injector, a 15 m polysiloxane DB-5 column, an electron ionization (EI) source, and a single quadrupole mass analyzer. The high vacuum is obtained using a small turbopump. Besides a traditional liquid injection, a heated sample probe can be used, which sucks in vapors. These vapors can be analyzed directly via membrane introduction mass spectrometry (MIMS) or concentrated via an internal dual-bed pre-concentrator. The portable MS can run continuously for 4 hours without external power or helium supply using small helium bottles and a swappable battery, see figure below.

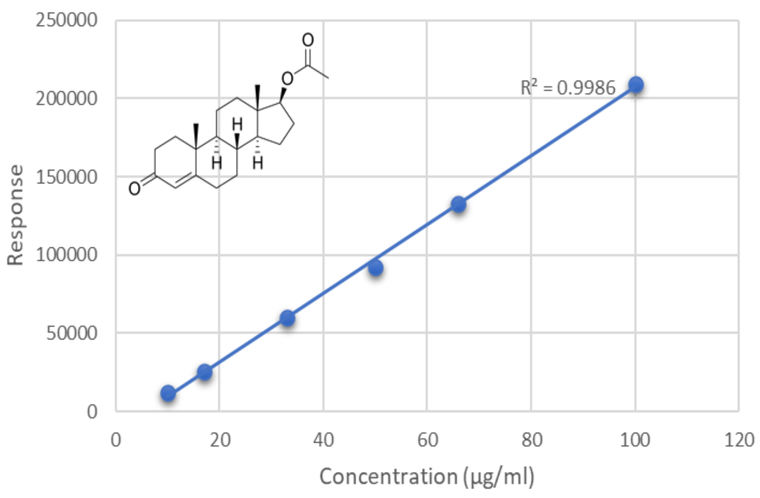


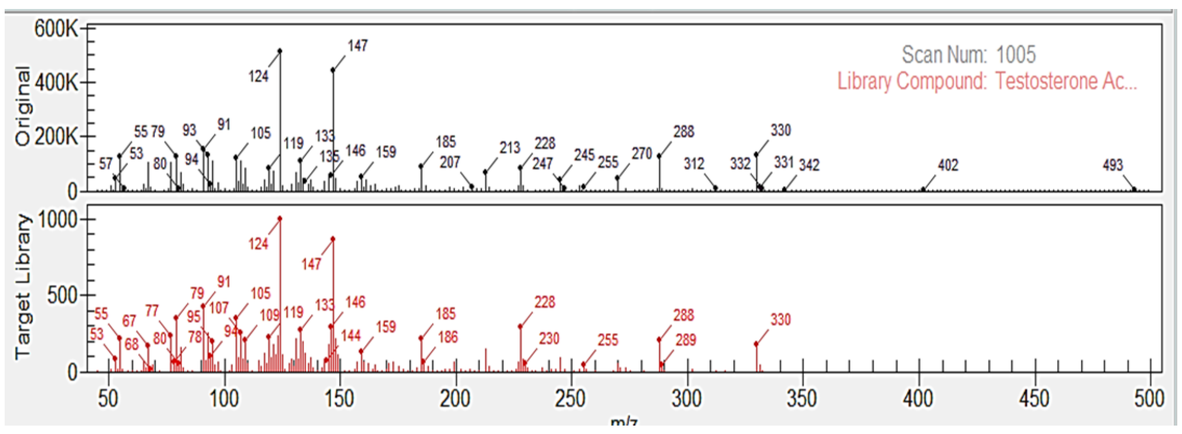
Schematic overview of the portable GC-MS. A) heated sample probe, B) internal dual-bed pre-concentrator, C) split-spitless injector

Results

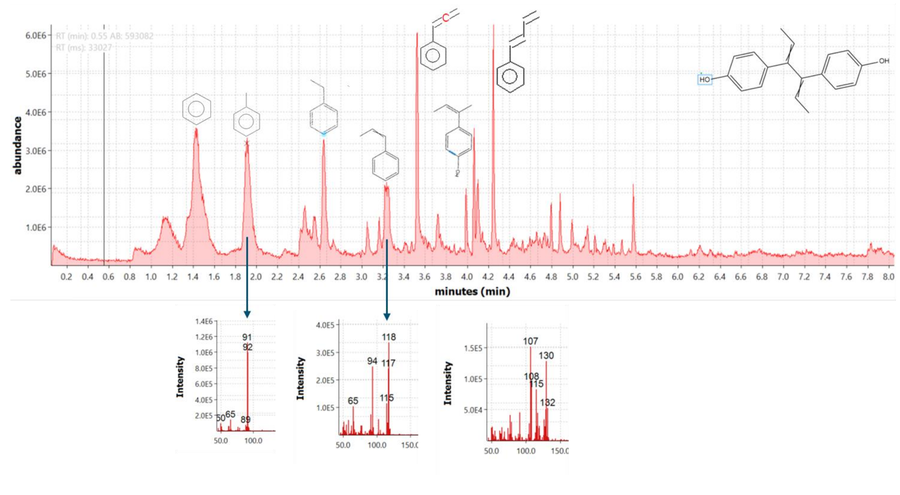
The linearity (figure right) and spectral quality of the MS were assessed (figure below).

Several applications were tested with the mobile MS.

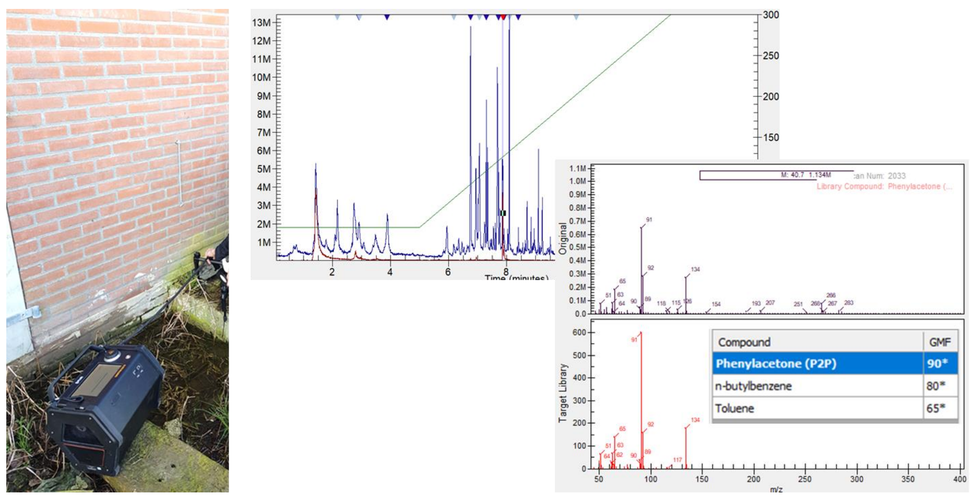




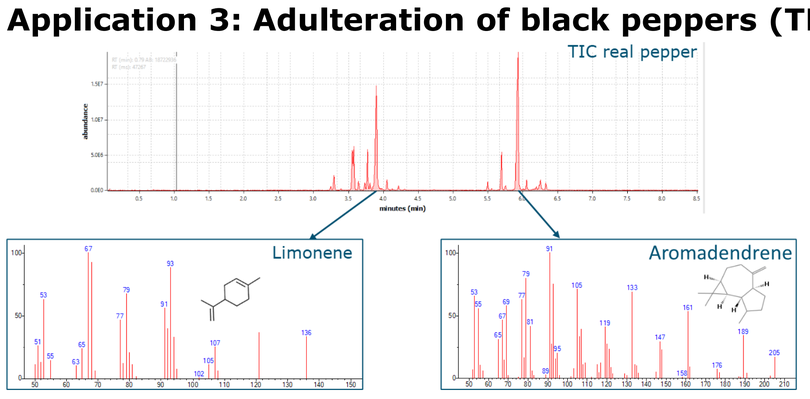
Application 1: Analysis of powders using a portable laser-TD-MS

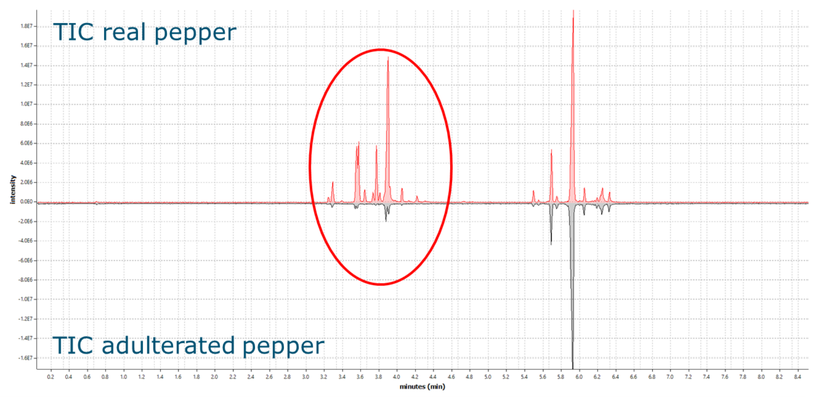


Application 2: Analysis of drugs dumping in manure pits (TD-MS)



Application 3: Adulteration of black peppers (TD-MS)





Acknowledgements

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