



## Deployable mass detection integrated into your process can enhance productivity and profitability

Alessio Zammataro, Microsaic Systems plc, GMS House, Boundary Road, Woking, Surrey, GU21 5BX, United Kingdom

### INTRODUCTION

The Microsaic 4000 MiD<sup>®</sup> is a miniaturised single quadrupole mass detector designed for non-MS specialist users. The system retains the performance of conventional MS systems but is substantially smaller, less complex to operate and maintain with significantly reduced cost of ownership. The 4000 MiD<sup>®</sup> is designed with the vacuum system, electronics and computer all integrated in one unit ensuring the instrument can be installed in places where no other MS can be easily deployed (Figure 1). The Microsaic MiDas<sup>™</sup> is a compact interface module that enables simple deployment of mass detection in a large variety of on-line, at-line and off-line applications. In particular, automated dilution is provided by the MiDas<sup>™</sup> allowing MS analysis with minimal sample handling.

Microsaic Systems' application portfolio ranges from traditional LC-MS analysis to previously unserved markets that will benefit from deployable mass detection at the point-of-need. In this application note the versatility of Microsaic Systems' application range is detailed along with the benefits of enhanced process productivity and profitability by integrating simple-to-use mass detection.

### Mass directed purification

Purification techniques, such as preparative and flash chromatography, have become a major part in the production of speciality chemicals and compound synthesis. Integrating simple-to-use mass detection in a traditional purification workflow overcomes many of the limitations of using optical detection alone. In the traditional workflow, fraction collection is typically monitored by ultraviolet/visible light (UV/VIS) detection. However, this technique is limited due to uncertainty over the composition of the collected fraction and leads to off-line MS analysis carried out by specialised facilities to precisely identify the fraction composition. Fraction collection with on-line mass detection eliminates the additional time and cost required for off-line MS analysis.

Process improvements with cost and time saving have been

successfully proven by Microsaic Systems and demonstrated for the purification of peptides and small molecules (1).

### Direct analysis

Direct injection MS analysis provides immediate mass identification and confirmation. The technique features automated on-line dilution with minimal sample preparation. Direct injection MS analysis finds applicability in the pharma sector as a means of rapidly screening samples and in academia as a teaching aid.

Detection of counterfeit and adulterated alcoholic drinks by direct injection MS analysis has been reported by Microsaic Systems (2). Furthermore, whisky fingerprint analysis was carried out to demonstrate the ability to distinguish difference in brands and blends of whiskies.

### Reaction monitoring

For on-line monitoring of chemical transformations, mass detection can be used to analyse in real-time the composition of the reaction taking place. This specific workflow provides data to monitor starting materials, identify the presence of reactive transients and impurities, determine steady-state conditions and optimize reaction yield. Reaction monitoring with on-line mass detection enables rapid screening and efficient reaction optimisation, removing the need for conventional off-line analysis with associated cost and time implications.

All the benefits of integrating simple-to-use mass detection into chemical synthesis workflows for real-time analysis were demonstrated by Microsaic Systems (3).

### Direct extraction

At-line extraction MS analysis can be achieved through the coupling of a hand-held extraction platform to the 4000 MiD<sup>®</sup> mass detector for automated sample clean-up and concentration prior to MS analysis.

Bringing mass spectrometry down to size





At-line extraction MS analysis of caffeine from Redbull (4) was successfully demonstrated by Microsaic Systems to be a rapid, simple and low cost approach for screening target analytes in complex matrices.

### Thin layer chromatography (TLC)

TLC-MS is growing in popularity with applications including identification and elucidation of unknown substances in research, forensic and environmental fields. The TLC-MS system is capable of providing an easy way to elute a desired TLC spot from a plate, direct it to the mass detector and effortlessly obtain mass spectral data for compound identification.

Integration of the TLC-MS interface with the miniaturised, deployable, single quadrupole 4000MiD<sup>®</sup> mass detector provides a completely standalone and easy to use solution for TLC spot identification (5).

### High performance liquid chromatography (HPLC)

HPLC coupled to MS is a powerful analytical tool for detection and identification of chemicals in complex mixtures. The compact nature of the Microsaic 4000 MiD<sup>®</sup> makes it an ideal upgrade for users wishing to extend the detection capability of their existing HPLC instrument. The design of 4000 MiD<sup>®</sup> enables chemists to have an easy-to-use single quadrupole mass detector for a wide range of bench-top LC applications.

Detection of pesticides, carbohydrates, peptides and quantification of a pharmaceutical drug using the 4000 MiD<sup>®</sup> reported from Microsaic Systems (6) has demonstrated great system application versatility with minimal instrument optimization required.

### CONCLUSIONS

Utilizing miniaturised mass detection earlier in your process can enhance your productivity, providing conclusive answers at a fraction of the cost and infrastructure of traditional mass spectrometry systems. The technology can be used by personnel who are not specialists in analytical chemistry, significantly broadening the range of applications available.

Microsaic's application portfolio, based on *on-line simple-to-use mass detection*, reduces the complexity of analytical processes compared to traditional off-line analysis. The applications range from LC-MS to previously unserved markets that benefit from deployable mass detection at the point-of-need.

### REFERENCES

Microsaic Systems' application notes:

- (1) Purification of peptides and small molecules using a preparative LC and Microsaic 4000 MiD<sup>®</sup> mass detector.
- (2) Rapid detection of counterfeit and adulterated alcoholic drinks by deployable and direct ESI-MS.
- (3) On-line reaction monitoring of continuous flow chemical synthesis using Microsaic 4000 MiD<sup>®</sup> mass spectrometer.
- (4) At-line extraction MS analysis of caffeine in Redbull.
- (5) Direct TLC-MS analysis using the 4000MiD<sup>®</sup>.
- (6) HPLC-MS applications of the Microsaic 4000 MiD<sup>®</sup>.

### Contact us

Could you be more productive by removing the bottleneck of traditional off-line analysis? Contact Jeremy Reddish to discuss integration of low cost miniaturised MS into your process.

[jreddish@microsaic.com](mailto:jreddish@microsaic.com)

[microsaic.com](http://microsaic.com)

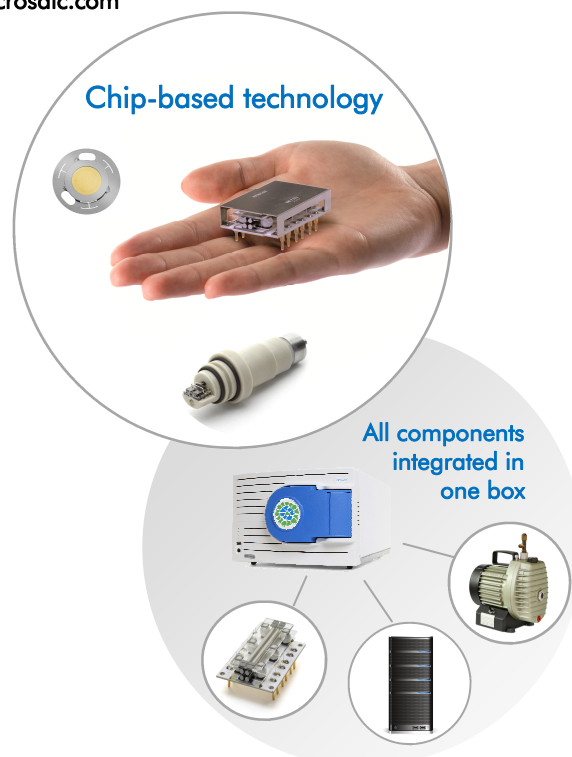


Figure 1. Microsaic 4000 MiD<sup>®</sup> utilises chip-based components.