



Application Note 258

Enhancing laboratory throughput using fully automated high-capacity sorptive extraction

This report describes how laboratory throughput for sampling of volatiles from liquid or solid matrices can be more than doubled, by using HiSorb high-capacity sorptive extraction on the Centri sample extraction and enrichment platform.

Sample throughput can be a concern for many analytical laboratories, especially those dealing with a large number of samples, or with critical samples that require fast turnaround. Related to this is the desire to reduce the cost per sample, which is common to many laboratories.

All these issues can be addressed by using HiSorb™ high-capacity sorptive extraction to eliminate time-consuming

and costly manual sample preparation. The technique uses robust, sensitive and selective PDMS probes, which are compatible with immersive or headspace extraction of liquids and solids. Importantly, when implemented on Markes' Centri® sample extraction and enrichment platform (Figure 1),



The probe storage module keeps up to twelve probes clean and ready to be used.



The robot inserts the probe into the vial and the assembly is incubated/agitated to ensure analyte equilibration with the PDMS stationary phase.



The probe is removed from the vial and a wash/dry station removes the residual sample matrix.



The probe is thermally desorbed in a specially designed port, and the vapours transferred to the focusing trap.



The trap is thermally desorbed (at up to 100°C/s) to inject the sample into the GC-MS.

Background to Centri®

Markes International's Centri system for GC-MS is the first platform to offer high-sensitivity unattended sample extraction and enrichment of VOCs and SVOCs in solid, liquid and gaseous samples.

Centri allows full automation of immersive and headspace extraction using HiSorb™, high-capacity sorptive extraction probes. It also offers full automation of headspace, SPME and tube-based thermal desorption with enrichment. Leading robotics and analyte-trapping technologies are used to improve sample throughput and maximise sensitivity for a range of applications – including profiling of foods, beverages and fragranced products, environmental monitoring, clinical investigations and forensic analysis.

In addition, Centri allows samples from any injection mode to be split and re-collected onto clean sorbent tubes, avoiding the need to repeat lengthy sample extraction procedures and improving security for valuable samples, amongst many other benefits.

For more on Centri, visit www.markes.com.



Figure 1: HiSorb workflow on the Centri platform.

HiSorb offers higher sample throughput than methods such as SPME, thanks to full automation of the entire workflow using gold-standard robotics and the patented 'grab and release' technology.^{1,2}

One valuable feature of the HiSorb module on Centri is the patented 'grab and release' technology of the HiSorb tool, enabling the use of multiple probes combined with a six-place integrated sample agitator to simultaneously extract multiple sample vials at any one time ('**prep-ahead**' mode).

This functionality stands in contrast to methods such as SPME, in which only one fiber is available at any given time – a factor that can add significantly to the overall analysis time (especially for long extractions).

To illustrate this advantage, Figure 2 compares a sequence of six extractions using HiSorb and using SPME-trap, both automated on Centri using Markes Instrument Control software. Both use a 60-minute sample preparation time and a 20-minute GC cycle time, but with HiSorb a sample is always ready for GC injection. This results in the overall analysis time for HiSorb being less than half of that for SPME-trap, *i.e.* a greater than two-fold improvement in system productivity.

In conclusion, we have shown that HiSorb high-capacity sorptive extraction, when implemented on Markes' automated Centri system, offers major reductions in cycle time for multiple samples, with consequent increases in system utilisation and laboratory productivity.

References

1. Markes International, *World Pat.*, WO2017194927A1, 2017.
2. Markes International, *UK Pat.*, GB2555182A, 2018.

Centri® and HiSorb™ are trademarks of Markes International.

Applications were performed under the stated analytical conditions. Operation under different conditions, or with incompatible sample matrices, may impact the performance shown.

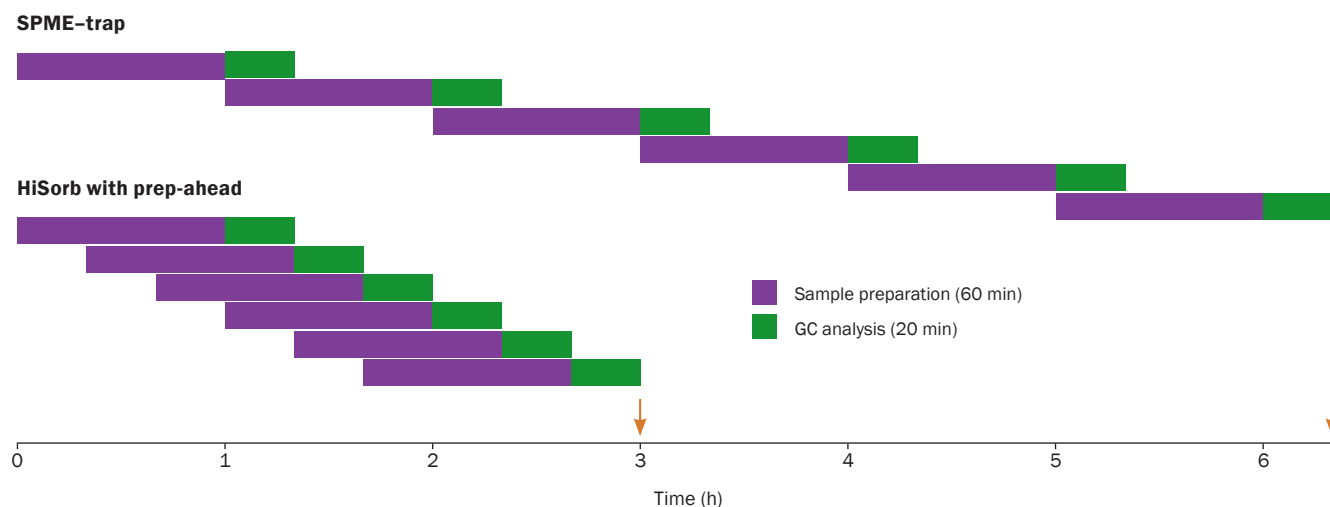


Figure 2: Comparison of sampling and analysis time for HiSorb (with prep-ahead) against that for SPME-trap, showing a greater than two-fold increase in productivity.

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