

GC & GC/MS Helium to Hydrogen Conversion Quick Reference Guide

This quick reference guide is set out to provide information on using and converting a instrument or a whole laboratory from helium to hydrogen. The issues from converting from helium to hydrogen are:

- Safety
- Instrument modifications
- Method changes (particularly within regulatory compliance industries)
- Time to develop/revalidate a method
- Knowledge and persons/company to perform the change

Safety

if you want to use hydrogen and do not have a supply in the laboratory with the appropriate safety, we would recommend a hydrogen generator. The generators come in different capacities depending on your requirements and have intrinsic safety features to limit hydrogen uses in cases of leaks or sudden pressure drops. In addition all GC manufacturers have hydrogen sensors that can be fitted to the GC which will shutdown the instrument if an unexpected leak should occur.

Instrument Modifications

If there is currently a hydrogen supply to the instrument the process for the instrument is relatively simple. However before you proceed you may need to check the requirements from the. This is particularly applicable to thermal desorbers (TD) and detectors such as PDHID, TCD and ECD. The performance of a TD and these detectors can also be application dependent, however there are further modifications that can be made to minimise detrimental effects. We would recommend a switching system (manual or automated) so you can switch between gases. This is a low cost and will enable the customer to maintain their existing analysis and develop and test/validate a new method without the possibility of instrument downtime and ingress of air. After changing carrier gas you will need to change the EPC configuration on a modern instrument to the new carrier, so as the correct flows or pressures can be displayed.

Method Changes

Methods will need to be adapted or modified to the carrier gas changes. This would be mainly carrier gas and detector flow adjustments. However changes will be required to data-handling parameters and realignment and recalibration of targeted and non targeted compounds.

Method Development/Validation

As the method parameters will need to change due to the new carrier gas, the analytical method will need to be revalidated. This will require parameters such as LOD's, linear range, repeatability, accuracy, robustness and recovery and /or whatever the regulatory body or bespoke requirements are.

Knowledge to Change

Instrument configurations and applications are numerous, therefore whoever performs the conversions need to consider all of the issues and have a detailed knowledge of your existing and future measurements for a successful outcome.

Benefits of Hydrogen vs Helium

The benefits of using hydrogen are:

- Readily available (on demand with generators)
- Lower cost
- Speed of analysis
- Improved separation

Specific considerations are detailed below.

Detector(s)	Other Benefits	Notes
FID	Could operate with 2 gases (H2 and Air).	Detector flows may have to be replumbed, adjusted and re-optimised and N2 or air used as make up flow as an alternative.
MS	May require less source cleaning.	You might need to purchase a newer source that is more inert to limit fragmentation. Direct flows into the source maybe limited to <1.5ml/min. However there are work arounds to these issues.
TCD		As the detection method is based on thermal conductivity, carrier gas conversion requires more detailed application knowledge.
ECD		Make up gas would have to remain as nitrogen or Methane/Argon mixture for the detector to function.
PHDID		Will not function correctly with hydrogen carrier gas.

Conclusion

If these guidelines are considered, you will have the confidence to convert from helium to hydrogen carrier gas, thus increasing your sample throughput and reducing costs, while still providing accurate and reliable results that are fit for purpose.

ChromSolutions Ltd

What we offer at ChromSolutions is our wealth of experience in analytical instrument sales and support (over 110 years distributed through the members of our company). We can help you from defining your requirements to the implementation of a robust analytical method fit for purpose.

For more information on GC/MS method development please contact us:



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