

WHITE PAPER

Determination of Volatile Organic Compounds

Background

Volatile organic compounds (VOCs) are chemical compounds, often man-made, that can be found in a wide variety of substances such as solvents, paints and industrial chemicals. They have a high vapor pressure and readily evaporate at room temperature so are present in the atmosphere and, when used inappropriately, can pose concerns for indoor air quality. VOCs, including chlorinated solvents, trihalomethanes and toluene, are unknowingly consumed by humans as they are leached into groundwater sources from industrial run-off and the chlorination of water. When inhaled or absorbed through the skin, they can have short- and long-term adverse health effects, ranging from headaches to memory loss and cancer.

Ensuring accurate calibration and avoiding contamination

Fortunately, VOCs can be determined very sensitively by gas chromatography (GC), which is often coupled with mass spectrometry (GC-MS). However, to ensure accurate calibration and avoid contamination, pure water that is effectively free from these compounds must be used in the preparation of samples, standards and blanks. Bacteria must also be absent from the water, as they can react with VOCs and release interfering by-products, often resulting in increased background noise and erroneous or enlarged peaks.

The ELGA PURELAB® Chorus range* provides pure water that is below the limit of detection for VOCs and bacteria to meet these requirements with ease. The PURELAB Chorus range has a series of purification technologies to remove different types of impurities that might interfere with trace GC-MS analysis of feedwater. This minimizes the risk of contamination of samples, standards and blanks, ensuring the accuracy of calibration and your results. The system provides reassurance, increases system uptime and reduces lifetime running costs that might cut into vital resources and research time.



Pure water for accurate VOC determination

The quality of the Analytical Research PURELAB Chorus 1 (ANR) was tested over two months, with water dispensed frequently to simulate typical usage patterns. Samples of water were taken regularly and analyzed for VOCs using purge and trap GC-MS. Table 1 shows results for 20 VOCs.

A total of 62 volatile compounds were screened for but none were detected, with a limit of detection of 0.05 ppb in all cases. Analysis of water from these systems clearly demonstrates results meeting the demands of GC-MS.



Table 1:

Compound	Concentration found (ppb)
Benzene	<0.05
Bromomethane	<0.05
n-Butylbenzene	<0.05
Carbon tetrachloride	<0.05
Chlorobenzene	<0.05
Dibromomethane	<0.05
1,2-Dichlorobenzene	<0.05
1,1-Dichloropropene	<0.05
Ethylbenzene	<0.05
Hexachlorobutadiene	<0.05
Isopropylbenzene	<0.05
Dichloromethane	<0.05
Naphthalene	<0.05
Styrene	<0.05
1,1,2,2-Tetrachloroethane	<0.05
Toluene	<0.05
Trichloroethene	<0.05
m-Xylene	<0.05
Vinyl Chloride	<0.05

Conclusion

For accurate VOC determination with GC or GC-MS, it is important to have reliable calibration standards and blanks, and to limit the potential for contamination of samples. The reliable and robust PURELAB Chorus range provides the technology and system design to remove all the major types of impurities that might interfere with VOC research.

*The PURELAB Chorus range offers a variety of different water purification systems, from the Chorus 1 that is used for the most critical and sensitive applications through to the Chorus 3, which is ideally suited for general purpose applications in your laboratory. The range is now available with an innovative free standing Dispenser that maximizes space and improves lab efficiency. Additionally, Hubgrade, ELGA's digital platform, works alongside any system to monitor equipment performance, ensuring laboratory work continues uninterrupted.

Dedicated to Discovery

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