

Formaldehyde Detection, Using SIFT-MS

Introduction

This document introduces an accurate and real-time method for detection and quantitation of formaldehyde in air. The method, which uses direct sampling and does not require any sample preparation, is performed by Syft Technologies' Voice200[®] SIFT-MS instruments.

Voice200 instruments apply Selected Ion Flow Tube Mass Spectrometry (SIFT-MS), which is a form of direct, real-time mass spectrometry. The ability to analyze whole air in real time makes these instrument an effective, highly sensitive solution for indoor air quality, workplace safety, and environmental air applications.

A ubiquitous and hazardous compound

Formaldehyde is ranked 25th overall in United States chemical production.¹ The United States' Environmental Protection Agency provides a succinct description of its widespread use and anthropogenic sources:

Formaldehyde is present in a wide variety of products including some plywood adhesives, abrasive materials, insulation, insecticides and embalming fluids. The major sources of anthropogenic emissions of formaldehyde are motor vehicle exhaust, power plants, manufacturing plants that produce or use formaldehyde or substances that contain it (i.e. glues), petroleum refineries, coking operations, incinerating, wood burning and tobacco smoke.²

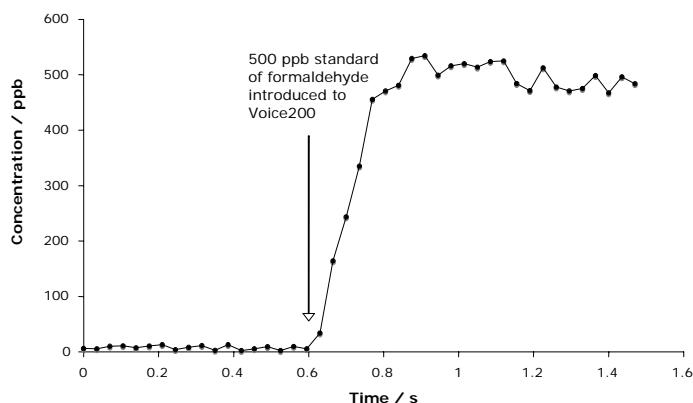
Widespread usage plus its formation as a byproduct of combustion and various industrial processes mean that formaldehyde significantly impacts air quality in workplaces, homes and the environment.

Much has been written on formaldehyde's role in photochemical smog formation, and its carcinogenic properties, particularly since being categorized as "reasonably anticipated to be a human carcinogen".¹ The combined effects of these concerns and formaldehyde's ubiquitous presence has focused attention on air quality in homes, workplaces and the environment.

Real-time formaldehyde detection and quantitation with the Voice200 instrument

Voice200 instruments quantify formaldehyde at low-ppt levels in less than 30 seconds. Figure 1 show results from a Voice200 measurement, demonstrating real-time detection of formaldehyde.

Figure 1. Rapid response of the Voice200 SIFT-MS instrument to introduction of a 500 ppb formaldehyde standard.



Technical features of SIFT-MS and formaldehyde detection

SIFT-MS utilizes soft chemical ionization for quantitative detection of VOCs in whole air. Formaldehyde is detected via the chemical ionization process:



Due to the soft ionization used and the low mass of the formaldehyde product ion formed in the reaction, this measurement provides highly selective detection of formaldehyde.

SIFT-MS has a linear range that extends over five orders of magnitude, with detection limits in the low-ppt range. Figure 2 shows a calibration curve for formaldehyde appropriate to worker safety applications.

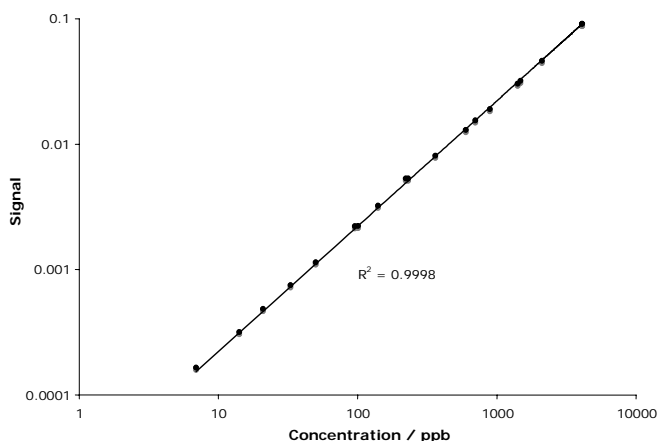


Figure 2. Linear detection of formaldehyde using a Syft Voice200 SIFT-MS instrument.

The Voice200 solution: Fast, Accurate, Simple

Unlike other mass spectrometry techniques, SIFT-MS provides laboratory-grade real-time results via a platform that is simple to operate and can be used on-site. The touch-screen, stand-alone system requires minimal operator training and provides instantaneous 'sample is safe' or 'sample is not safe' results (Figure 3).

Figure 3. Analytical results are displayed very clearly and unambiguously on the Voice200's touch screen display. In this example, hazardous concentrations of formaldehyde are present in a shipping container, but other fumigants are below the customer's chosen reporting threshold (RT).

Scan Results		voice200 [®]
Fumigant Analysis		▲
ID 122156	03-04 12:23	Menu
formaldehyde	2.6 ppm ▲	
phosphine	<RT	
ethylene oxide	<RT	
ethylene dibromide	<RT	
chloropicrin	<RT	
hydrogen cyanide	<RT	
methyl bromide	<RT	
vikane	<RT	
		Next

For more information about SIFT-MS and Voice200 instruments, please contact your nearest Syft Technologies office, your local authorized distributor, or visit www.syft.com.

References

1. Environmental Health and Safety Online. http://www.ehso.com/chem_formaldehyde.htm (accessed 16 October 2012).
2. United States Environmental Protection Agency. http://cfpub.epa.gov/ncea/iris_drafts/recordisplay.cfm?deid=223614 (accessed 16 October 2012).