

REAL-TIME AMBIENT AIR

MONITORING CAMPAIGNS USING SYFT SIFT-MS

Vaughan S. Langford, Christine J. Reed, Daniel B. Milligan, Murray J. McEwan, Sheryl A. Barringer, and W. James Harper

The sensitivity, selectivity and real-time analysis offered by the Syft Technologies' Voice200ultra SIFT-MS solution provides simple, reliable and continuous analysis of trace volatile organic compounds in ambient air.

Key Benefits

- Analytical results in seconds
- Detection limits in the pptv range
- Direct air analysis without preconcentration or drying
- Readily deployed to site and robust
- Remote operation
- Easy to use

Volatile organic compounds (VOCs) are typically found in air in the part-per-trillion and part-perbillion by volume (pptv and ppbv) concentration range. Since both anthropogenic and biogenic sources of VOCs display significant time dependence, traditional GC/MS methodologies are unsuitable, due to preconcentration requirements and slow analysis times.

Alternatively, Selected Ion Flow Tube Mass Spectrometry (SIFT-MS) detects and quantifies VOCs in realtime in air to pptv levels with no sample preparation. This application note illustrates how readily a Syft Technologies' Voice200 SIFT-MS instrument can be deployed for a short-term campaign to provide detailed, real-time VOC analysis.

A Syft Voice200 instrument was deployed at Shu-Lin Primary School in Taoyuan County, near Taipei, Taiwan R.O.C. from 19 to 21 July 2011. The school is situated adjacent to an industrial area. Concentration data were obtained for 48 compounds, many of which had been previously identified at the site using GC/MS. Results are shown in Figures 1 and 2 for several compounds that exhibited interesting trends, including toluene, methanol, isopropyl alcohol, acetone and N,N-dimethylformamide. Concentrations ranged from sub ppbv to peak levels for methanol of ~250 ppbv.

Elevated concentrations indicate periods when pollutants were released from a stack. Instantaneous variations arise from gusty wind conditions at the coastal site. The use of multiple reagent ions per compound confirms that changes are real and provides enhanced selectivity compared to other real-time techniques (reagent ions are switched in less than 10 ms in the Voice200). Figure 2 shows the close agreement obtained from independent measurements of N,N-dimethylformamide using the H₃O⁺ and NO⁺ reagent ions with their m/z = 74 and 72 product ions, respectively.

Conclusion

The high-speed analysis provided by SIFT-MS makes it ideally suited to continuous monitoring of ambient VOCs. The Syft Voice200 SIFT-MS solution provides a robust, easily deployed and operated package for sensitive, quantitative real-time monitoring of a diverse range of VOCs and inorganic gases.

EXPERIMENTAL METHOD

| | |
|--------------------------------------------------------------------------|--------------------------------------------------|
| Sample | Ambient air |
| Accessories | 5 meters of 1/4" o.d. Teflon tubing ² |
| 1. Air drawn directly by instrument. 2. Residence time of ~3 minutes. | |

SIFT-MS ANALYSIS

| | |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Instrument | Voice200® |
| Inlet Type | High performance |
| Sample Flow | 25 sccm |
| Software | Voice200 & LabSyft |
| Analysis Type | Full scan; m/z 10 – 200 |
| Reagent ions | H ₃ O ⁺ , NO ⁺ , O ₂ ⁺ |
| Compounds | 48 in total, including aromatic and aliphatic hydrocarbons, aldehydes, ketones, halocarbons, alcohols, esters, acrylates and various nitrogen- and sulfurcontaining compounds |
| Dwell time per mass | 500 ms per measurement cycle |
| Dwell time resolution | 5 minutes |
| Typical LOD ² | 0.5 pptv |
| 1. Full scan data were rapidly processed using the LabSyft software to give concentrations. 2. Per data point; LODs are improved using a SIM approach. | |

Figure 1. Temporal concentrations of aromatic and oxygenated compounds derived from full scan SIFT-MS data.*

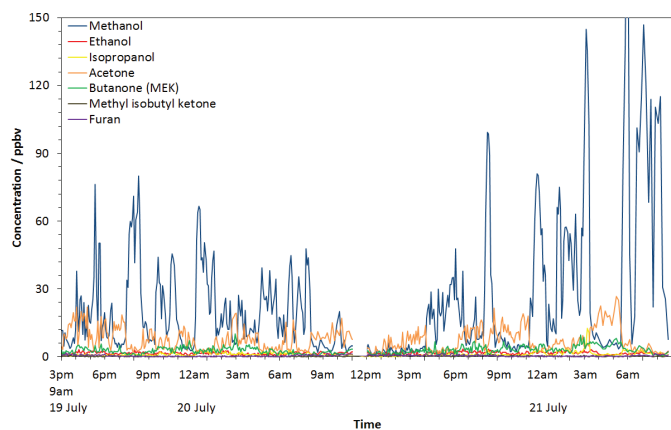
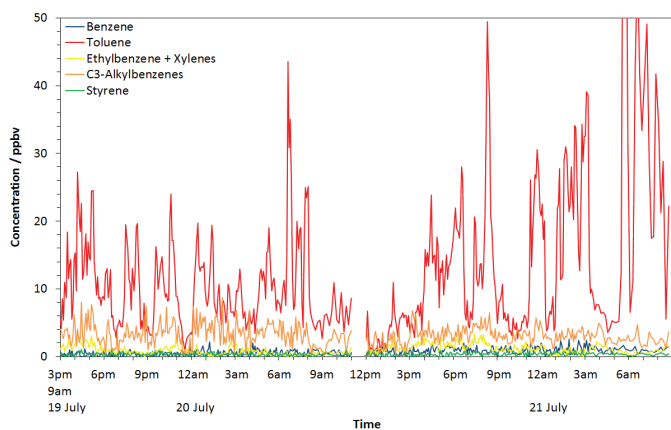
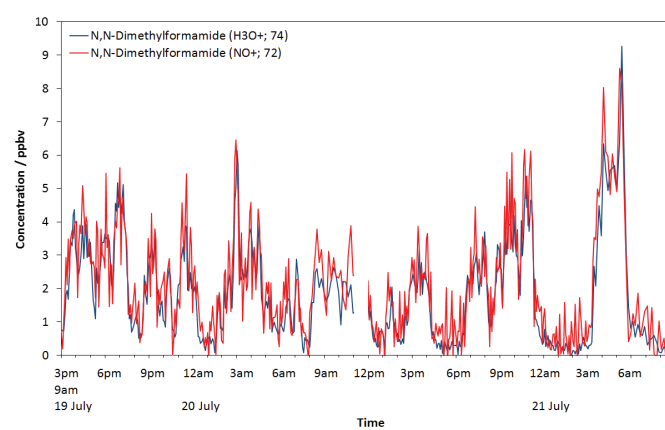


Figure 2. Comparison of the performance of two SIFT-MS reagent ions for analysis of N,N-dimethylformamide.*



* The instrument was used to perform other analyses between 11am and 12pm on 20 July.

References

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Syft Technologies Limited
68 St Asaph St, Christchurch
8011, New Zealand

Syft Technologies Ltd
New Zealand | +64-3-3386701

Syft Technologies Inc.
North America | +1-818-4504270

Syft Technologies GmbH
Germany | +49-6151-5201341

Syft Technologies Korea
Korea | +82-31-7056701

W: www.syft.com
E: info@syft.com