

AN010

# Fast MicroGC Analysis of BTX Compounds

---



## Keywords

BTX, Benzene, Toluene, m-Xylene, O-Xylene, VOC, Volatile Organic Compounds, microGC

## Summary & Relevance

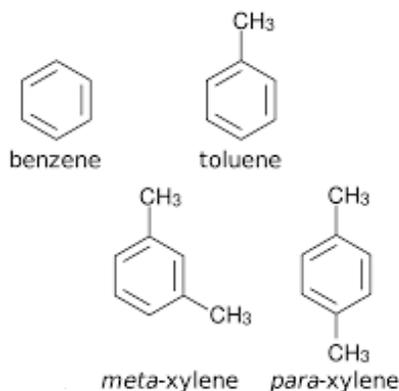
Organic chemical compounds, aka Volatile Organic Compounds (VOCs) are found everywhere in both indoor and outdoor environments because they have become essential ingredients in many products and materials.

- Outdoors, VOCs are volatilized or released into the air mostly during manufacture or use of everyday products and materials.
- Indoors, VOCs are mostly released into the air from the use of products and materials containing VOCs.

VOCs are of concern equally as both indoor and outdoor air pollutants. However, the emphasis of that concern outdoors is different from indoors. The main concern indoors is the potential for VOCs to adversely impact the health of people that are exposed. While VOCs can also be a health concern outdoors, the EPA regulates VOCs outdoors mainly because of their ability to create photochemical smog under certain conditions.

Omniscent has developed a world's first Fast MicroGC method using its flagship OMNI-2100 MEMS-based product to conduct fast BTX analysis for screening purposes in order to empower Environmental Health & Safety operators to swiftly act to minimize acute exposure and serious harm to both humans and the environment. Typical applications for this fast method range from portable /shoulder carry implementation to a stationary leak detection installation.

## Organic Compounds & Structures:



## Sample Preparation

Mixture of Benzene, Toluene, m- & o-Xylene (BTX standard) in nitrogen as a balancing gas (Airgas, Lot #: 126-401534788-1) was mixed with ZeroAir (Airgas, Lot #: 12-402018658-1) to prepare 2ppm of BTX sample. Below are the various gas flow rates used to achieve a 2ppm Benzene concentration:

Zero Air Flow	BTX Standard Flow	Sample Benzene concentration
sccm	sccm	ppm
26.6	176.3	2

## OMNI-2100 MicroGC Method

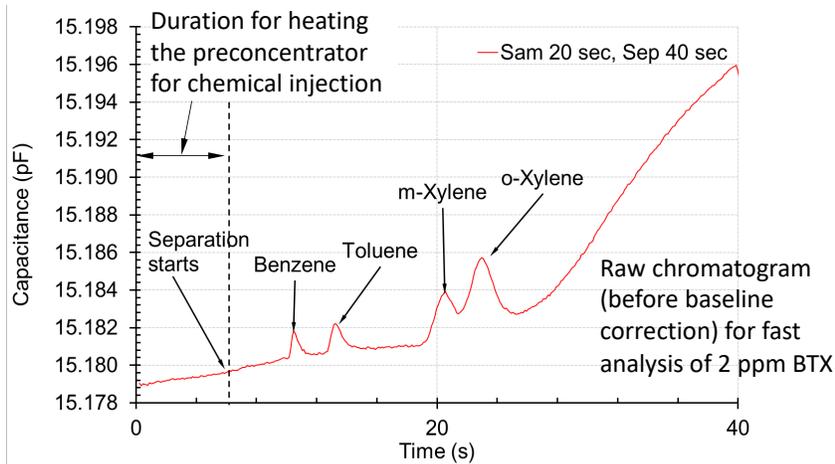
The fast analysis method only requires 2 steps:

- Step 1: sampling for 20 sec onto the pre-concentrator.
- Step 2: chromatographic separation of the chemical compounds for 40 sec.

Note: if only benzene detection is the primary goal, then the separation time can be reduced to 12 seconds. OMNI-2100 sampling time is user-programmable and can be set between 1 sec to 1 hour.

## Fast MicroGC Results

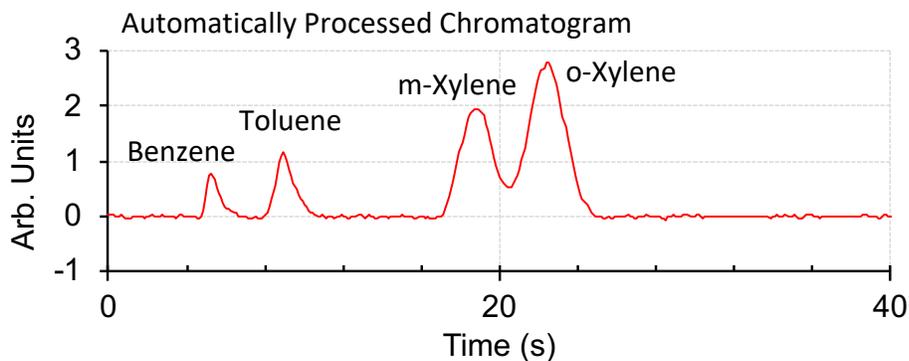
The estimated limit of detection (LoD) for this Fast MicroGC method is 100-200 ppb making it ideal for quantifying compounds concentration levels of 500 ppb to 10 ppm. For fence line monitoring applications, a 30min-long cycle for OMNI-2100 achieves an LoD of 0.3ppb to quantify the EPA-set action limit of 3ppb.



OMNI-2100 is equipped with an automation software for processing the raw chromatograms. It performs the following functions:

- Detect peaks
- Compensate for the baseline variation
- Report the result in tabular format or chromatogram for further analysis

Below is an example of the raw chromatogram processing performed by the automation SW:



## Conclusion

The above OMNI-2100 developed method for Fast MicroGC BTX analysis shows the adaptability of the OMNI-2100 to conduct fast analysis when needed. The analysis duration can be further reduced and the chromatographic separation time can be limited to 12 sec if only benzene is the compound of interest. This makes OMNI-2100 platform very effective for various VOC detection scenarios ranging from fenceline monitoring where a sub-ppb detection limit is required to handheld / shoulder-carry application where fast detection is desired in a highly polluted environment.