

Preparation of (S)VOC standard gas mixtures & transfer standards

Dita Heikens, Annarita Baldan and Jianrong Li
VSL, Delft, The Netherlands, www.vsl.nl, dheikens@vsl.nl

Volatile Organic Compounds (VOCs) emissions from construction products can pose a significant source of indoor air pollution. A wide range of VOCs can be released and concentrations may be particularly elevated in new buildings, following refurbishment. An important group of hazardous components is the semi-VOCs (SVOCs). These components have boiling points between 240-260°C to 380-400°C (ISO 16000-61) and low vapor pressure. In the framework of the EMRP project MACPoll VSL has designed and built a gas generation system that is dedicated to (S)VOC standards.

The preparation of (S)VOC standards is proven by a cross-check study in between VSL, BAM and NPL.

(S)VOC generation system



(S)VOC generation system with sampling ports.

Validation of the generation system

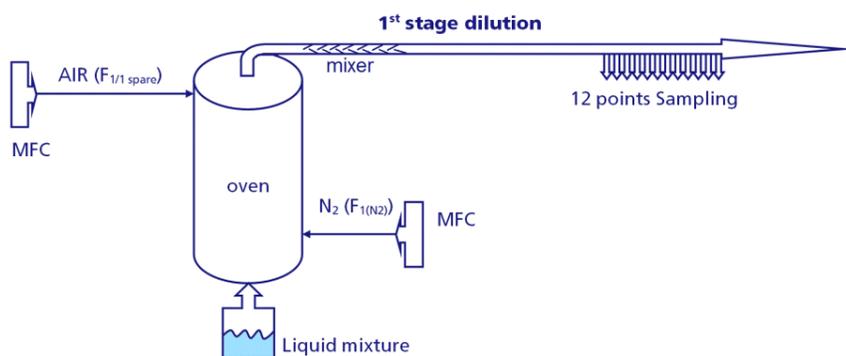
The generation system is validated in 2 ways:

- 3) By a cross-check study with NPL and BAM. For this cross check study, VSL has prepared standards containing 30ng and 100ng (S)VOC on Tenax TA® thermal desorption tubes. BAM and NPL have analyzed these tubes and showed good results on the preparation done by VSL!
- 2) And by comparison with manually spiked tubes. The tubes that have been loaded with the generation system are compared with tubes that are spiked manually.

In general the result of the cross-check studies confirm the preparation values within their uncertainty.



Working principle



The working principle follows ISO 6145-4 "Preparation of calibration gas mixtures- Dynamic volumetric methods: Continuous syringe injection".

A known liquid mixture of (S)VOC's is prepared by gravimetry and is diluted in a known amount of solvent. This solution is forced through a capillary with a controlled flow stream. This solution goes into a self designed oven where it evaporates. Subsequently the vapors are diluted with a know flow of zero gas. A (S)VOC standard atmosphere is created! This gas mixture is traceable to mass and volume:

1. **Mass:** A calibrated analytical balance is used to prepare the (S)VOC solution and to weigh its mass flow through the capillary at regular intervals.
2. **Volume:** Primary flow piston provers are used to calibrate the dilution flow.

The preparation of transfer standards is done by pumped sampling of known volumes of the (S)VOC dynamic standard gas mixture into thermal desorption tubes according to ISO 16017-1.

Tenax TA® is found to be a suitable sorbent for most (S)VOC's.

Possibilities

So far the following components have been generated and validated:

Components	Concentration		U (k=2)	BP (°C)
	Min (µg/m³)	Max (µg/m³)		
Styrene (as a reference)	30	>500	3%	145
n-decane (n-C10)	30	>500	3%	174
2-ethyl-1-hexanol	30	119	5%	184
1-methyl-2-pyrrolidone (NMP)	30	124	5%	202
benzylalcohol	30	400	5%	204
1-dodecene	100		5%	216
dodecamethylcyclhexasiloxane	30	400	5%	245
butylated hydroxytoluene (BHT)	30	400	5%	265
dimethyl phthalate (DMP)	30	120	5%	282
hexadecane (n-C16)	30	400	5%	287
diethyl phthalate (DEP)	30	400	5%	296
n-octadecane (n-C18)	30	320	5%	317
dibutyl phthalate (DBP)	30	67	10%	340
eicosane (n-C20)	30	60	~10%	343

Services

Testing and calibration of monitoring equipment or gas-sensors
Development and validation of measurement methods for workplace, indoor and ambient air contaminants. The facility is equipped with exposure chambers to simulate climate conditions
Preparation of transfer standards in sorbent tubes
Organization of inter-laboratory comparisons for sampling and measurements in air quality.