

Evolution of the perceived odour intensity assessed by GC-Olfactometry of emissions from household and building products

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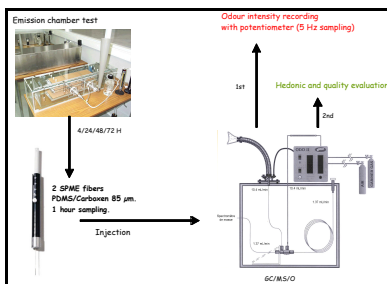
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SUMMARY

Real-time monitoring of perceived odour intensity by a sniffing subject allows the construction of an olfactogram associated with a chromatogram. This improves the matching of odorous events with VOC peaks. Analytical resolution, olfactory adaptation, odour persistence, breath frequency, assessor's awareness affect interpretation of the olfactogram. Peak height or peak area can be used to determine the odour intensity of a given odorous compound and thus determine the most odor-active compound. The number of odorous events tends to decrease with the decrease of VOC emission whereas precise identification of odorous compounds tends to improve with time.

INTRODUCTION

Olfactometry associated with gas chromatography (GC-O) represents a complementary tool to both chemical and sensory evaluation of emissions from household and building products. Matching a perceived odour with a chromatogram peak may be difficult if an appropriate acquisition method is not used. Instantaneous and continuous recording of odour intensity was used to achieve this point and assess the evolution of odorous compounds with decreasing VOC emission.



Emissions of a linoleum, an alkyd paint and an air freshener were assessed by SPME / GC-MS-O during 4 days. SPME (solid phase micro-extraction) is a simple technique allowing the direct injection of absorbed and adsorbed compounds on a GC. SPME is sensitive but lacks quantification as it provides non linear response.

Acquisition of the perceived odour intensity of a sniffing subject at the outlet of the GC-MS-O was provided by moving a linear potentiometer linked to a high frequency recorder.

The use of a polar column improves analytical resolution of oxygenated compounds, particularly carboxylic acids, known as very odorous compounds.

RESULTS

Recorded olfactograms were superposed to chromatograms to achieve odorous compounds identification. A second sample run provides the determination of odour quality notes and hedonics (red compounds are perceived as unpleasant, blue as pleasant).

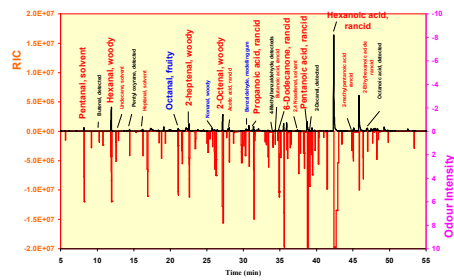


Fig.1 : Alkyd paint (t + 3h)

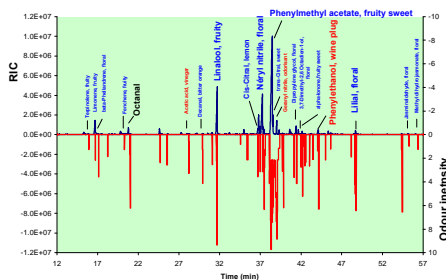


Fig. 2 : Air Freshener (t + 4h)

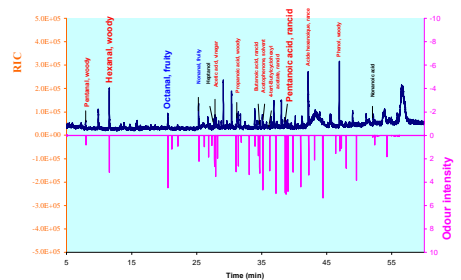


Fig. 3 : Linoleum flooring (t + 3h)

DISCUSSION

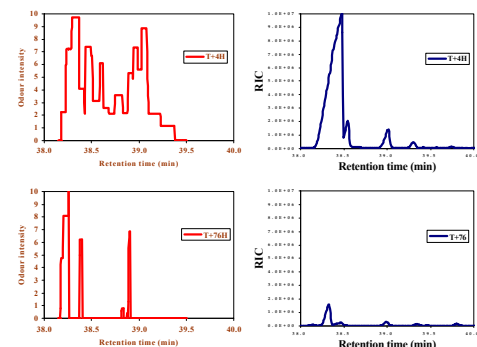


Fig. 4 : Compared evolution of olfactogram (left) and chromatogram (right) (air freshener detail)

The number of perceived odorous events decreased with time along with VOC emission, but a better resolution was achieved with the olfactogram improving identification of odorous compounds (Fig. 4). This implies that several parameters affect the olfactogram.

- Olfactory adaptation and odour persistence (e.g. phenylmethyl acetate) affect olfactogram resolution.
- Breath frequency and subject's awareness may affect odorous event detection and perceived intensity rating.
- Overall, sample representativity throughout sampling and sniffing port outlet is the key parameter to achieve a proper quantification of the odour attribute of a given compound.
- Further research is needed for GC-MS-O to become a standardized technique.