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Occurrence of odorous compounds in the emission of building materials measured by GC-olfactometry

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In order to identify the most frequent odorous compounds associated with indoor background odour, the static headspace of 16 building material samples (painted and unpainted gypsum boards, wood boards, linoleum and vinyl flooring materials, carpets and sealants) has been characterized by gas chromatography – olfactometry.

Material samples were conditioned in 5 ml-vials and mildly heated at 50 °C during 24 hours. Sampling was realized through the septum cap by solid phase microextraction on a carboxen/pdms fiber during 1 hour. The fiber was then immediately injected on a GC equipped with a polar capillary column. The double detection provided consisted of a mass spectrometer and an olfactometry sniffing port. The perceived odour intensity of the sniffing subject was continuously monitored by a potentiometer associated with a data acquisition system (Fig. 1). Two male subjects performed the experiment.

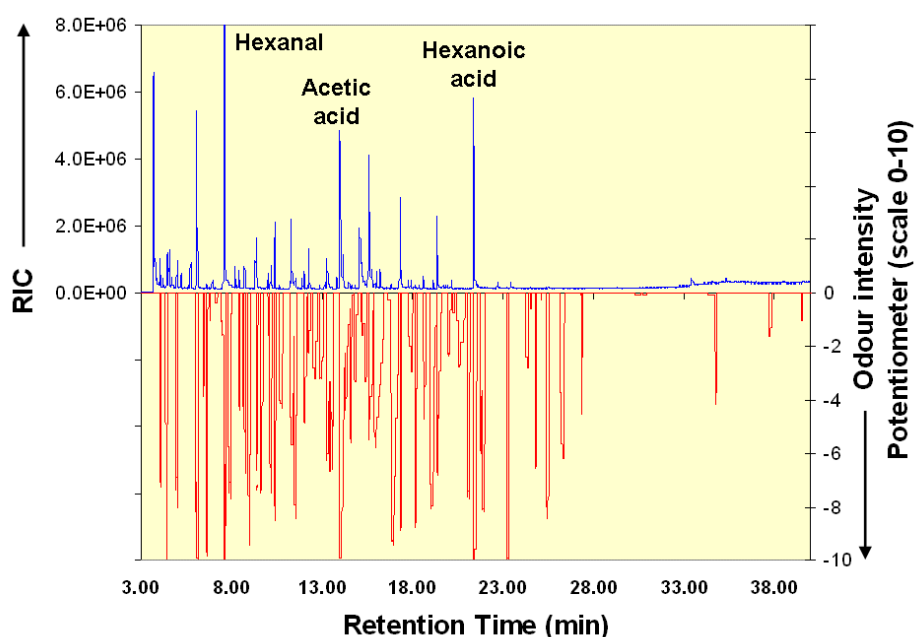


Fig.1: Typical chromatogram (relative ion count) and monitored odour intensity for a linoleum sample.

The number of identified odorous compounds vary from 0 (gypsum board) to 60 (linoleum). A total of 118 odorous compounds were detected. Carboxylic acids and aldehydes were the most frequent (Fig. 2). Specific compounds like 4-phenylcyclohexene or 4-cyanocyclohexene were exclusively associated with carpet samples. Unsaturated carbonyl compounds and lactones (e.g. gamma-hexalactone) were mostly associated with linoleum samples.

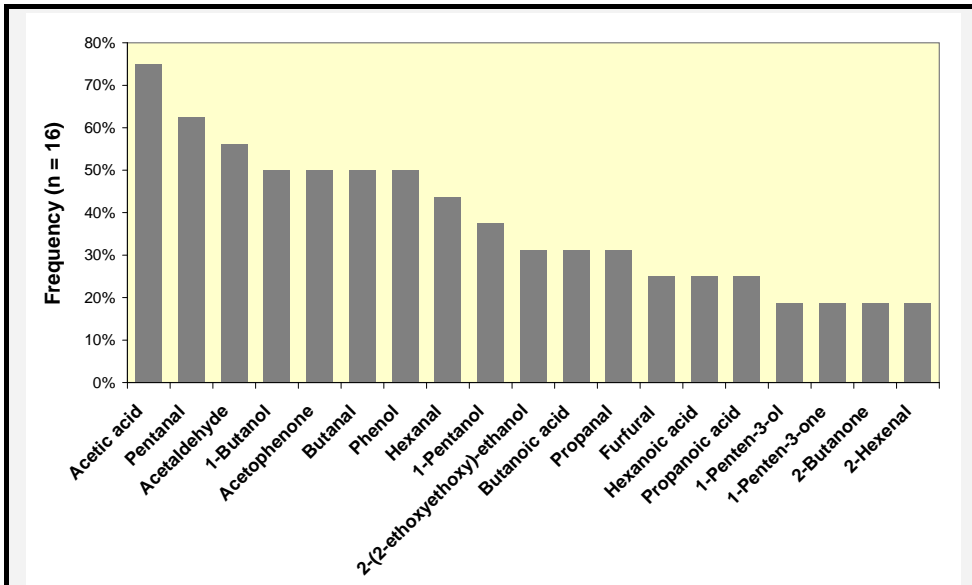


Fig. 2: Frequency of detection of the 20 major odorous compounds in the 16 materials.

The identified olfactory part of building material emissions is dominated by oxygenated compounds. A large part of odorous events remains unidentified: 67% for a vinyl flooring material and up to 89% for an alkoxysilicone sealant. The occurrence of these major odorous compounds is related to oxidative ageing of the materials in contact with atmosphere, but also to biomass presence (wood products and linoleum). Further research is needed to relate these parameters with background odour in closed spaces.