

## Project *brief*

Thünen Institute of Wood Research

2025/26a

# Follow your nose? - Olfactory evaluation of wood products

Katja Butter<sup>1</sup>, Viviane Gallus<sup>2</sup>, Christine Ida Hucke<sup>2</sup>, Christoph van Thriel<sup>2</sup>, Martin Ohlmeyer<sup>1</sup>

- **Terpene-dominated odours (e.g. pine wood) are preferred to other wood odours**
- **Wood odours (especially from solid wood) are more familiar and pleasant**
- **Prior information about the health effects of building product odours alters the effect of odours**
- **Odour assessments of building products and interiors with the aim of protecting health appear questionable**

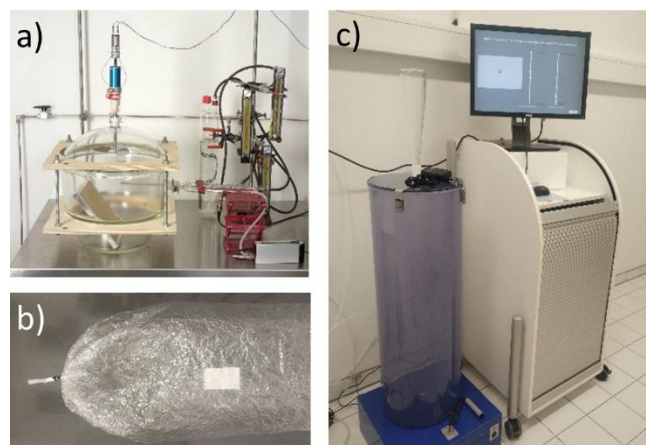
### Background and objectives

We spend most of our time indoors, where we are exposed to emissions (mainly volatile organic compounds, VOCs) from building products and various other products. For certain VOCs, including those emitted from wood products, there are guideline values that should not be exceeded indoors. These guidelines are primarily intended to protect particularly vulnerable population groups such as children, the elderly and the sick. However, there are currently efforts to regulate indoor spaces and building products, including wood products, with regard to their odour. But is this effective?

Together with the Leibniz Research Centre for Working Environment and Human Factors (IfADo), we investigated how wood odours are evaluated in terms of intensity, hedonic perception (subjective pleasant or unpleasant assessment of an odour) and familiarity. Typically, such sensory tests are carried out without knowledge of the source of the odour. We wondered whether the evaluations would change if the participants were familiar with the material. We also wanted to find out whether specific information about the health effects of building product odours, provided before the odour test, would influence the evaluations.

### Methodology

As part of the project, test subjects ( $n = 32$ ) evaluated the odours of various wood products (pine and oak wood, OSB poplar, OSB pine (OSB = oriented strand board), cork). The odours were presented in accordance with DIN ISO 16000-28:2001 (Fig. 1). The VOC concentrations of the odours were based on the guideline values for indoor air of the German Committee for Indoor Air Quality and were analytically determined using GC-MS (gas chromatography followed by mass spectrometry; DIN ISO 16000-6:2022). In order to investigate the influence of the visual context, each odour was presented both with and without a corresponding image of the material (*within-subject design*).



**Figure 1:** The exhaust air from an emission test chamber (a) loaded with a building product is filled into gas sampling bags (b). The bags are placed in a special odour presentation device (c) that allows the test subjects to trigger the release of the odour (source: Thünen Institute/Christina Waitkus (1a), Katja Butter (1b, 1c)).

In a further experiment, the procedure was repeated, but supplemented by a video that informed the test subjects ( $n = 64$ ) about the potential positive (PLACEBO video) or negative health effects (NOCEBO video) of VOCs or odours from building products before the odour assessment (*mixed factorial design*). The effectiveness of the videos was evaluated in advance in an online study using various questionnaires and tests on a separate group of test subjects ( $n = 162$ ) to ensure that they achieved the intended effect. In addition, a survey was conducted among visitors to the *Grüne Woche* fair in Berlin ( $n = 144$ ). They rated five odours (OSB pine, pine, spruce, oak and beech wood, Fig. 2) in terms of their hedonic perception. Some of the respondents received information about the respective wood product, while others were not given this information (*mixed factorial design*).



**Figure 2:** Odour set in glass bottles (Source: Thünen Institute/Katja Butter)

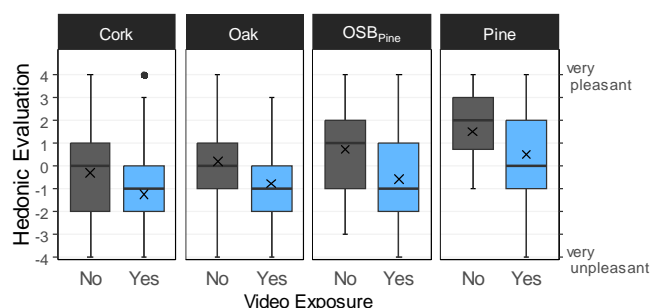
## Results

Terpene-dominated scents, such as pine wood, were perceived as the most familiar and pleasant. This preference could be due to the frequent use of coniferous woods in construction. Terpenes also occur naturally in various plants. They are found in numerous everyday products such as detergents, personal care products, cleaning agents and air fresheners, and are used in alternative medicine, especially in aroma therapy. As the proportion of aldehydes and/or acetic acid in the odours increased, their familiarity and hedonic rating decreased. Looking at the TVOC concentration (total of all VOCs) alone did not provide any meaningful information when it came to comparing different odours – neither in terms of their hedonic value nor their intensity. The specific VOC composition of the odour is always decisive. Although odours in low and high concentrations were perceived differently in terms of intensity, a higher concentration did not necessarily lead to a lower hedonic rating. While oak wood was perceived as less pleasant in higher concentrations, the ratings for the low and high concentrations of pine wood and OSB pine remained comparably pleasant.

The study showed that wood odours are processed through multisensory integration. When the test subjects saw the corresponding material image during the odour presentation, they rated the odours as more familiar and pleasant, while the assessment of intensity was hardly or not at all influenced. The *Grüne Woche* fair survey also revealed that the image is not necessarily required, but that knowledge of the underlying material is sufficient to change perception. These effects were particularly evident in solid wood, while the hedonic value of wood-based materials (in this case OSB) remained unchanged or decreased. It is well known that solid wood is preferred over wood-based materials because it is perceived as more natural and less industrially processed.

The effect of the videos on the test subjects led to an unexpected result. After watching the videos, the groups differed significantly in their concerns about the possible health effects of building product odours. The PLACEBO group also considered it more likely that the odours could have positive effects, while the NOCEBO group tended to believe in negative effects. Nevertheless, the odour ratings of the two groups did not differ in terms of hedonic value, familiarity or

intensity. Surprisingly, however, both groups rated the odours as significantly more unpleasant than in the first experiment without video influence (Fig. 3). The videos were deliberately designed to be factual and neutral and were not conceived as advertising films, so they did not use exaggerations or false statements. In addition to the health aspects, both videos also provided general information about VOCs and odours from building products. The test subjects have a certain amount of background knowledge and may already have had negative experiences with odours from building products or generally unpleasant odours in indoor spaces. The results therefore point to a so-called confirmation bias: people tend to select and interpret information in such a way that it confirms their own expectations and experiences.



**Figure 3:** Influence of the videos on hedonic evaluation. Note: Evaluations of the PLACBEO and NOCEBO groups are summarised; only a selection of odours is shown (Source: own calculation)

## Conclusion

Odours are perceived very differently by individuals and their assessment depends heavily on the context. It is therefore important to critically examine whether it makes sense to regulate building products on the basis of odour assessments. Using the concentration of individual VOCs as a measure of potential odour nuisance in indoor spaces also appears questionable. As long as the guideline values for VOCs in indoor spaces are complied with, odours alone do not pose a health risk. No additional benefit can be derived from measures designed to regulate odours from building products or indoor air in order to avert health risks.

## Further Information

### Contact

<sup>1</sup> Thünen Institute of Wood Research  
[Martin.Ohlmeyer@thuenen.de](mailto:Martin.Ohlmeyer@thuenen.de)  
[www.thuenen.de/hf](http://www.thuenen.de/hf)

### Partner

<sup>2</sup> Leibniz Research Centre for Working Environment and Human Factors  
[Thriel@ifado.de](mailto:Thriel@ifado.de)  
[www.ifado.de](http://www.ifado.de)

### Run time

07.2020-10.2024

### Project-ID

2172

### Publications

[Butter et al. \(2025\)](#): The impact of visual context on the perception of wood odours. *Build Environ* 280:113129.

[Gallus et al. \(2025\)](#): Conceptual processing of natural, complex odours: multisensory effects on behaviour and ERSP. *Brain Research* 1863: 149839.

[Thünen-Report Nr. 121](#)

### Funded by



Federal Ministry  
of Food  
and Agriculture

by decision of the  
German Bundestag

DOI: 10.3220/253-2025-179