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Preservative pre-treated wood and indoor air quality

Background

The impacts our built environment can have on occupants is significant given we spend 90% of our time in buildings. Whether it is patient recovery, student performance, productivity in offices or our own comfort at home, all are influenced by the indoor environment and the design, products and systems used to create and furnish our buildings. An important component of this is the indoor air quality and the products we select for use.

The indoor air environment is a complex subject that needs to consider the nature and source of any chemical, its ability to pass into the indoor air, its effect on humans when in the air, and the ability to remove it from the air by ventilation. By nature we are all different, but consideration of the indoor air quality debate does not always take into account our highly variable personal habits, occupancy and preferences that strongly influence the indoor environments encountered in our homes and work places.

Research

In mid-2017, the Wood Protection Association (WPA) commissioned BRE to help them understand how treated timber performs in the context of air quality within buildings and how evidence can actively support the continued safe and appropriate use of wood preservatives to enhance the performance of timber used in construction. The review considered industrially pre-treated wood products that have been impregnated with a wood preservative formulation in the context of a 2017 new build UK domestic construction.

Preservative treated timber is present in a range of construction products in our homes, including parts of the structural timber frame, window frames, tiling battens and in the roof structure. These products do not normally extend into the living space itself but are integral to the envelope of the building structure. The World Health Organisation (1989) classifies organic pollutants according to three types based on their boiling points which are often summed and reported as TVOC (total volatile organic compounds) a value for which may appear in certification schemes as a limit e.g. in BREEAM the TVOC threshold is 300 µg/m³.

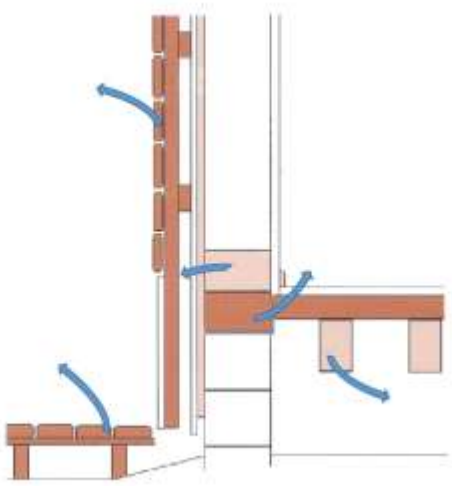
Table 1 Boiling points of some wood preservative active ingredients.

Chemical name	CAS number	Boiling Point °C
Tebuconazole	107534-96-3	476.9
Permethrin	52645-53-1	200
Propiconazole	60207-90-1	180

Table 1 shows some common wood preservative active ingredients presented along with their respective boiling points. It is important to add that it is to be expected that evaporation to air may be reduced if the material is fixed in or adsorbed into the wood substrate, as is normally the case with wood preservatives. There are no specific air quality thresholds for timber products treated with preservatives. Again, this may be out of the scope of indoor air quality regulations due to these types of products not being in direct contact with the indoor air.

The BRE review found that, whilst the number of emission studies conducted on treated timber was limited, this was almost certainly because uncoated treated wood articles are not normally found within the living space of buildings. In one UK study timbers treated with different 'new generation' Use Class 3 wood preservatives (i.e. those currently on the UK market) were tested for emissions in chambers and a cabin replicating a room and wall structure. The chamber emission test was extended for up to 90 days to check longer term emissions from the treated timber, due to the low volatility of the active substances in the treated wood. The report states that "The outcome of the tests showed that the effect of emissions from the treated wood on indoor air quality of a test cabin building was negligible". This study clearly showed that for timber treated with currently available preservatives the impact on indoor air quality is low.

An indication of the pathways for an emission to air (represented by a blue arrow) from treated timber products in a ground floor construction and for exterior wood cladding and decking structures is shown. Whilst the BRE review did not rigorously analyse the pathways for a volatile emission to move from a treated timber article used in house construction to the air, it is worth noting the complexity of the issue.



For example, a volatile compound may be present in treated wood but because of the complexity of the pathway to indoor air it may never have an impact on indoor air quality. Indeed, this is likely to be the case in most common forms of building construction. In these cases the volatile in the air would have to pass through several materials (Table 2) to reach the indoor air compartment. In addition, the ventilation within the house structure and the air tightness of the home need to be considered as they can further restrict or dilute any potential emission reaching indoor air.

Table 2 Emission pathways from treated articles to the indoor air.

Treated wood article	**Pathway**
Roof timber	Emission to air, through insulation, lining board, plasterboard and ceiling paint and/or paper.
Wood window	Emission to air through decorative internal coating.
Tiling battens	Emission to air through roofing felt and membrane then vented to outdoor air.
Sole plate	Emission to air through insulation, plasterboard, wall lining paper + decorative coatings.

Conclusions

Indoor air quality regulations do not regulate treated timber and its active ingredients - most likely as they are not used in direct contact with indoor air. The available scientific evidence suggests that emissions from preservative treated wood articles to air are small and further to that the complexity of the pathway from air within the building envelope/cavity to the indoor air compartment means that the "concentration reaching indoor air is negligible". Thus the evidence indicates preservative treated wood poses no threat to indoor air quality. As requested, the BRE review undertaken on behalf of WPA recommends considering further research and testing to add to the existing knowledge and this is currently under consideration.

END

Note:
1. This executive summary report, approved by BRE, is published courtesy of the WPA and the group of WPA members who provided the funding for BRE to conduct the review.

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