Formaldehyde in solid wood

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We have often discussed about formaldehyde and we have also written many technical and informative articles on it, but maybe we have never focused our attention on a very important peculiarity of this substance that concerns its ubiquitous nature.
But what is the meaning of the term ubiquitous and what does it have to do with formaldehyde?
Ubiquitous simply means "being present everywhere" and formaldehyde can be really found in many places. Perhaps it is not so well known, for example, that formaldehyde is one of the most widespread substances in the immense interstellar spaces of the Universe, but it has also been detected in the atmospheres of some planets close to Earth such as Venus and Mars.
Looking a little closer to us, we can discover that formaldehyde is easily formed in common combustion processes and some studies testify its specific formation within Softwoods forests as a result of photochemical reactions involving some terpene-based components emitted by trees.
But the ubiquity of formaldehyde is even wider if we consider that it is also present within us being a by-product of some metabolic processes of our body. Although in very low concentrations, formaldehyde is then found within all our cells and in our own blood.

Also solid wood contain this substance, albeit in very small quantities. Nevertheless, formaldehyde of natural origin is detectable and measurable in all wood-based materials.
Several studies have been carried out and their conclusions confirm that formaldehyde is formed by the main components of wood (cellulose, hemicellulose and lignin), as well as by its extractives. The detectable concentrations depend on the wood species and on many other factors that concern, for example, the temperature of the drying processes, the times of these processes and the initial and final moisture content of wood.
The measurable amount of formaldehyde in solid wood is also influenced by the time elapsed since drying and measurement, as well as by intermediate storage conditions.

The measurements carried out by the studies mentioned above, included both formaldehyde content (measurement carried out with the perforator method ISO 12460-5) and the emission measured with the chamber method (EN 717-1).
In the following table we report the values detected by some studies on various wood species after drying. The minimum and maximum values here reported have been listed referring to the two wood families, namely Softwoods and Hardwoods.

Wood Specie	Chamber test (EN 717-1) ppm	Perforator (ISO 12460-5) mg/100 g
Softwoods	0,003 - 0,005	0,071 - 0,086
Hardwoods	0,003 - 0,004	0,034 - 0,051

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The resulting data are certainly very low considering, for example, that the limit for E1class, mandatory by law in many Countries is equal to 0.1 ppm for the chamber and 8 mg/100 g for the perforator.
These data suggest a tendency to a higher presence of formaldehyde in Softwoods rather than in Hardwoods, but literature also shows other contradictory data in this regard. This variability is probably ascribable to all the factors mentioned above, as well as to the uncertainty of the analytical methods adopted on such extremely low values.
Some studies carried out by Catas also testify that heat-treated wood tends to show a higher formaldehyde emission than untreated wood due to the reasonably effect of the thermal degradation of some of its components which also includes the formation of formaldehyde together with that of other volatile substances.

In conclusion it is widely demonstrated that the ubiquitous nature of formaldehyde, the subject of this article, also concerns solid wood. Therefore, formaldehyde of natural origin can be detected in solid wood regardless the industrial processes to which it is subject.
This observation firstly suggests a careful attention in reference to its declared danger and recommended limitations. Considering what we have reported above, in fact, it is not possible to request that a certain material does not contain formaldehyde or, in other words, that its formaldehyde content is equal to "zero".
These demands cannot be obviously satisfied by all the wood-based products given the formaldehyde content of natural origin we have previously discussed.

Also some advertising citations like "formaldehyde-free" should be also considered with great attention both for their real truthfulness but also, and above all, for not exasperating this subject which could produce significant negative effects for the entire wood and furniture supply chain. In the long run, in fact, the market could be led to consider the natural presence of formaldehyde in solid wood as a negative factor in comparison with other materials bringing to the undesirable detriment of all the products of our sector

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