

Fire-resistant wood by impregnation with cement

Improving fire resistance is a topical issue, particularly in the construction of multi-storey timber buildings. In weathered outdoor conditions flame retardants require a secure fixation in the wood. This invention improves the fire resistance of beech veneer wood in combination with wash-out resistance by cement impregnation. The process uses a carrier liquid that allows cement to be applied to wooden structures for fire protection.



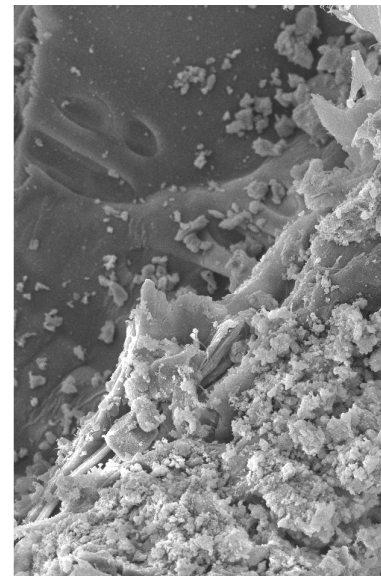
A carrier liquid enables cement to penetrate wood

This new process makes it possible to impregnate wood veneers with inorganic solids to increase their fire resistance and durability. Protective agents and ultra-fine cement are dispersed in ethylene glycol and applied to the wood using an alternating pressure process. The subsequent water storage of the wood hydrates and fixes the cement in the wood.

- 01 Use of impregnable wood types such as beech or pine sapwood
- 02 Dispersion of ultra fine cement particles and protective agents in glycol
- 03 Dispersion impregnation by standard vacuum process – subsequent water storage enables hydration inside the wood structure
- 04 Increased durability and reduced flammability of impregnated

REFERENCES:

[View Patent Application](#)



Wood cross section (left) and beechwood infiltrated with cement Scanning Electroscopie Microscopy SEM (right)

IP RIGHTS

Validated
DE, GB
and FR

2020

CHALLENGE

The impregnation of wood with cement-based fire retardants has shown inconsistent results, highlighting the need for process optimisation. Variations in effectiveness and significant deviations in mass change affect fire tests, particularly in the fire chamber and fire shaft. Thicker components can perform better and achieve B1 fire classification. The challenge is to optimise process parameters to minimise variability and achieve consistent, improved fire resistance. Further investigation were essential to clarify these factors and validate potential improvements.

INNOVATION

The Portland cement in the wood contains bound water which is released when the wood is heated, drawing heat from the flames. The hydration creates a strong anchor that increases resistance to leaching. Aluminum-hydroxide releases water when heated, while calcium oxalate monohydrate decomposes in an endothermic process, releasing water, carbon dioxide and carbon monoxide. The process with carrier liquid and subsequent storage in water allows the use of flame retardants that were previously unsuitable.

TRL 08

TRL 07

TRL 06

TRL 05

TRL 04

TRL 03

TRL 02

TRL 01

Technology Readiness Level (TRL)

01 Basic principles observed · 02 Technology concept formulated · 03 Experimental proof of concept · 04 Technology validated in lab · 05 Technology validated in relevant environment · 06 Technology demonstrated in relevant environment · 07 System prototype demonstrated in operational environment · 08 System complete and qualified



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