



Performance of modified wood – Bio4ever project - how to convince people to use bio-based building materials?

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Introduction

Today's bio-based building materials, even if well characterized from the technical point of view, often lack reliable models describing performance during their service life. The overall goal of the BIO4ever project is to contribute to public awareness, by demonstrating the environmental benefits to be gained from the knowledge-based use of bio-based materials in buildings.

Modification technologies tested within the BIO4ever project

Performance of 120 selected façade materials provided by over 30 industrial and academic partners from 17 countries is under evaluation. The experimental samples were classified in seven categories, according to treatment applied: natural wood (or other bio-based materials), chemical modification, thermal modification, impregnations, coatings and/or surface treatments, composites, and hybrid modification, that include combination of at least two different treatments (Table 1).

Table 1: Categories of bio-based facades materials tested within BIO4ever project

Wood modification technology	Samples examples	Number of tested materials
natural	wood, bamboo	19
chemical	acetylation, furfurylation	5
composites	panels, bio-ceramics, tricoya, wood plastic composites	7
coating & surface treatments	different coatings, carbonized wood, nanocoatings	16
impregnation	DMDHEU, Knittex, Madurit, Fixapret	28
thermal modification	vacuum, saturated steam, oil heat treatment	20
hybrid modification	thermal treatment + coating, thermal treatment + impregnation, acetylation + coating etc.	25

Performance of investigated samples

All bio-materials are under extensive characterization before, during and after degradation by biotic and abiotic agents (natural weathering in San Michele, Italy, 46°11'15"N, 11°08'00"E), in order to provide experimental data to be used for better understanding the bio-materials performance/degradation as a function of time. The appearance change, being result of the progress of natural weathering is presented on Figure 1.

The experimental data, acquired during BIO4ever project duration are used for development of the numerical models simulating the material degradation in a function of time and exposure. The weather data calculated according to the ASHRAE 2013 database allows numerical simulation of cumulative radiation and

temperature on building facades, situated in 6000 locations all over the world. Dedicated algorithms simulating material deterioration by taking into account specific material characteristics, kinetic and intensity of weathering process as well as specific architectonic details are extensively tested. The main project output is a software simulating biomaterials aesthetic performance integrated with LCA interactive calculation. The tool, dedicated for investors, architects, construction engineers, professional builders, suppliers and other relevant parties, including also final customers is now under validation and integration with the BIM software.



Figure 1: Appearance of investigated samples at the beginning of the test (a) and after 12 months of natural weathering at the southern exposure (b).

References

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