SURFACE PROPERTIES OF THERMALLY WOOD AFTER ARTIFICIAL AND NATURAL WEATHERING

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FP1407
ModWoodLife

COST Action FP1407 2nd Conference, Brno, Czech Republic.

BACKGROUND

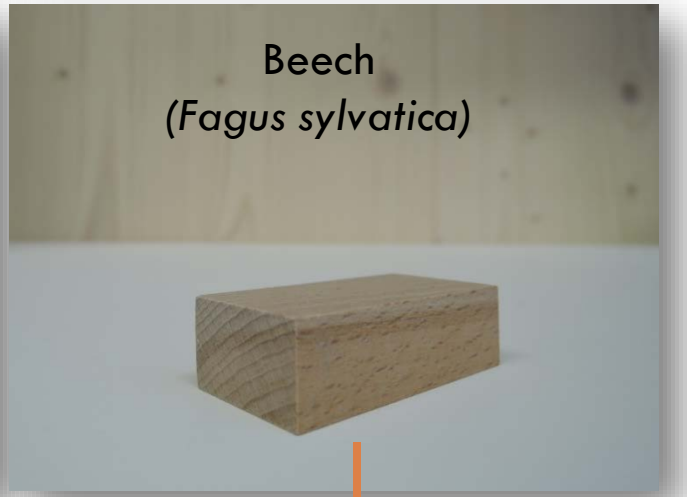
The use of wood in outdoor, above-ground applications is increasing in Europe.

Despite the importance of this parameter, WEE is not completely understood.

More information related to service life and maintenance costs should be provided.

WEE is one of the most important factors influencing service life.

MATERIALS



1.5 cm × 2.5 cm × 5.0 cm

Thermal modification
Silvapro® process

AGING PROCEDURES






AGING PROCEDURES






AGING PROCEDURES



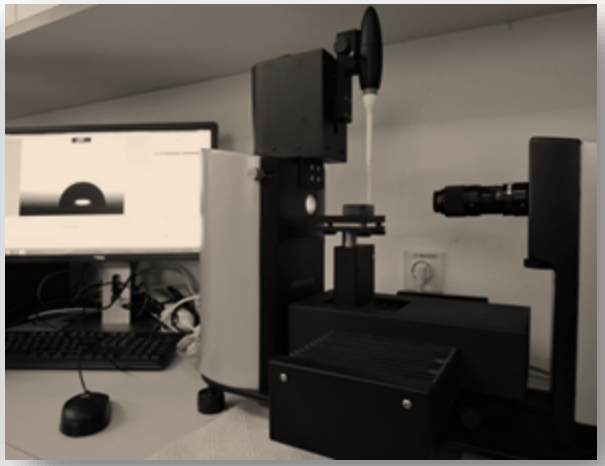


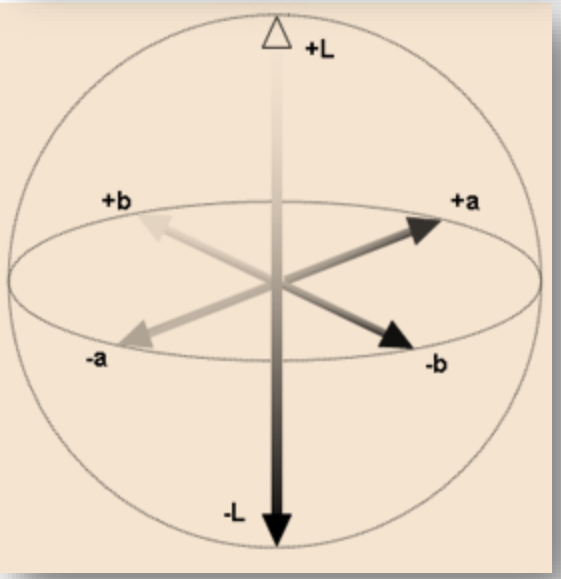

AGING PROCEDURES

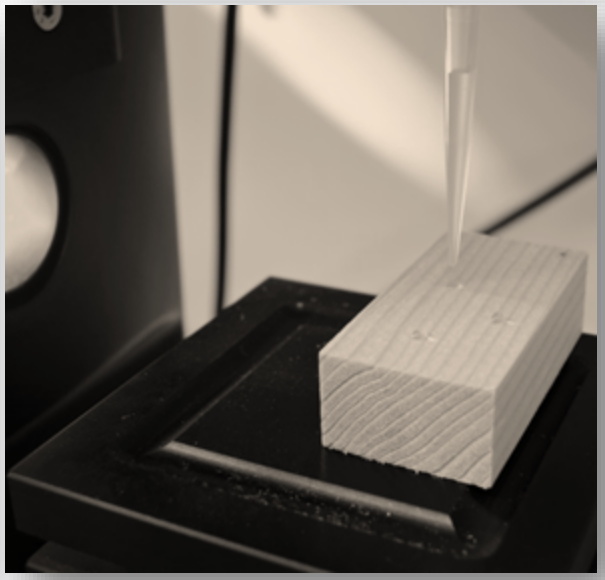





WOOD CHARACTERIZATION







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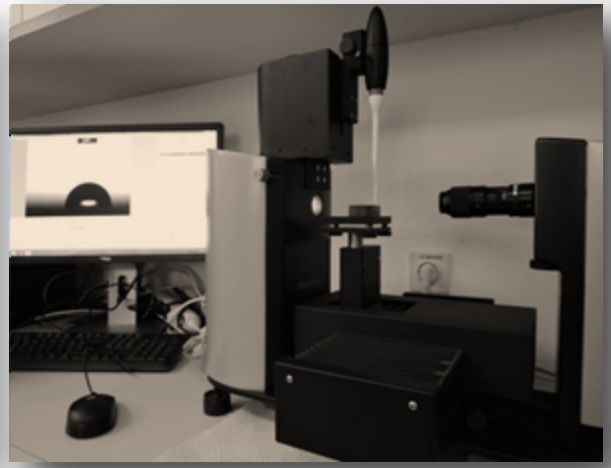

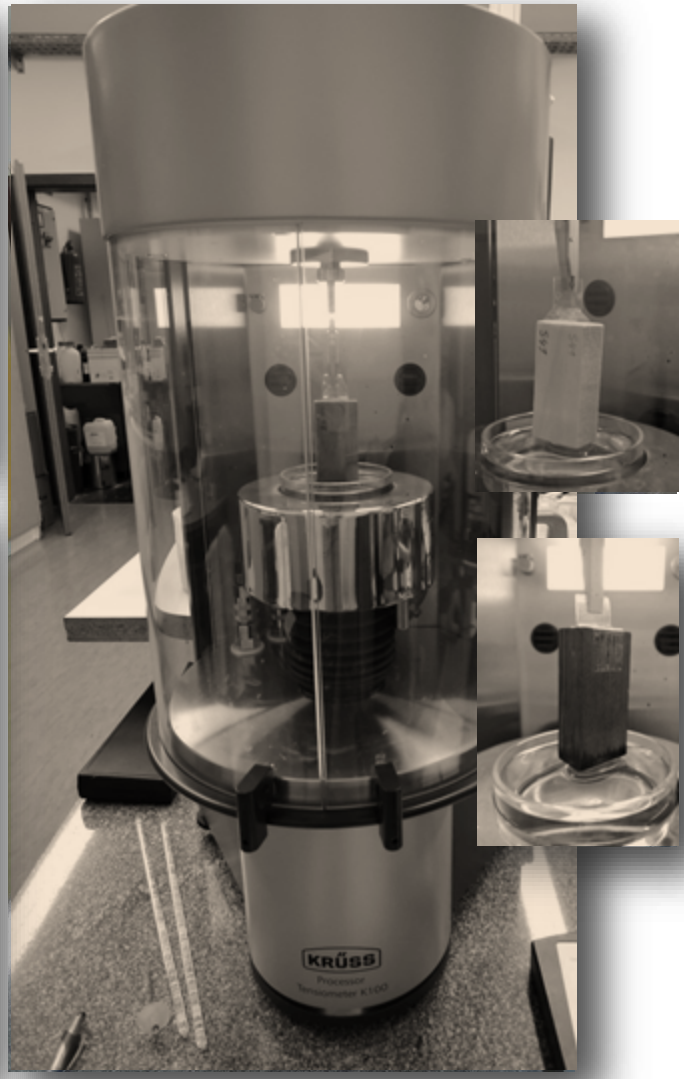

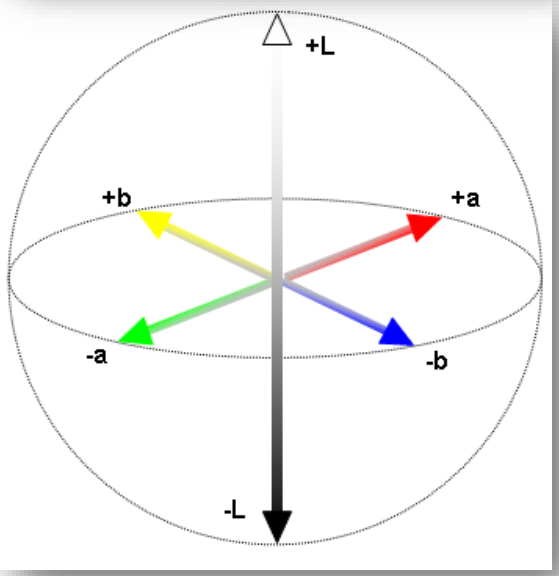

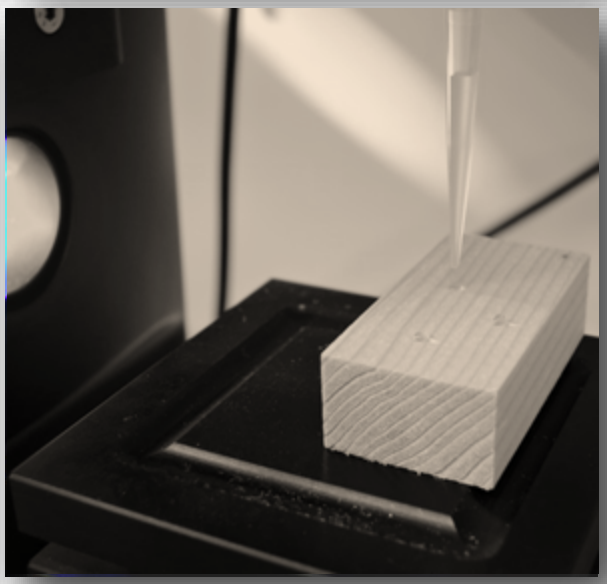

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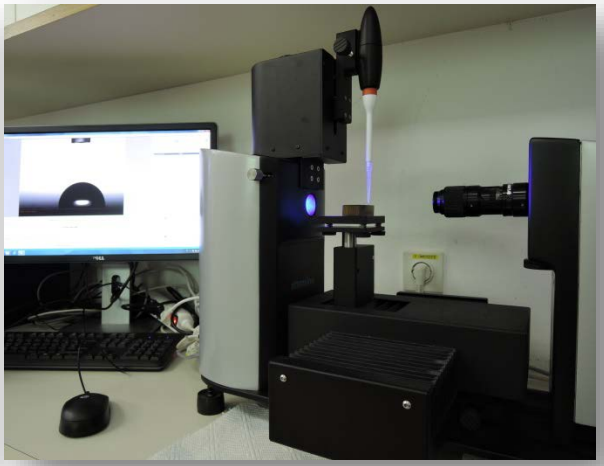

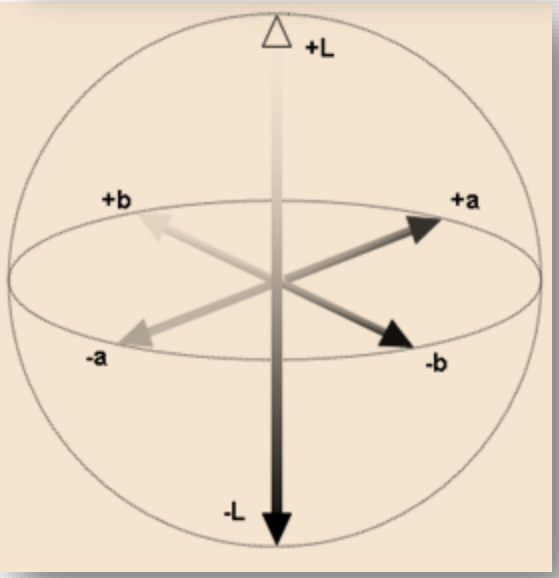

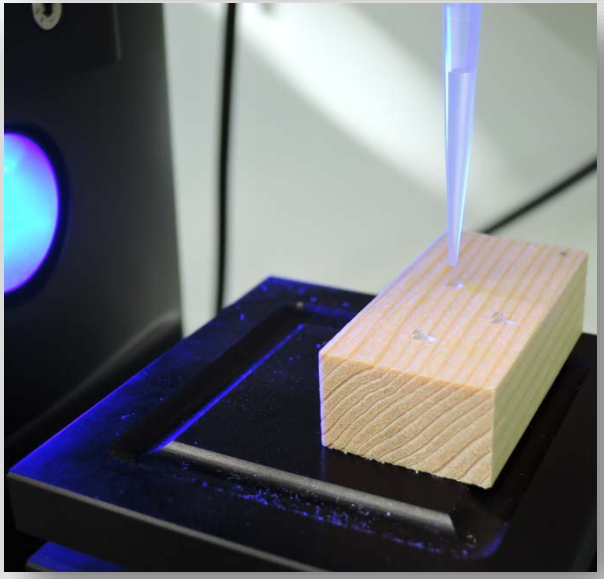

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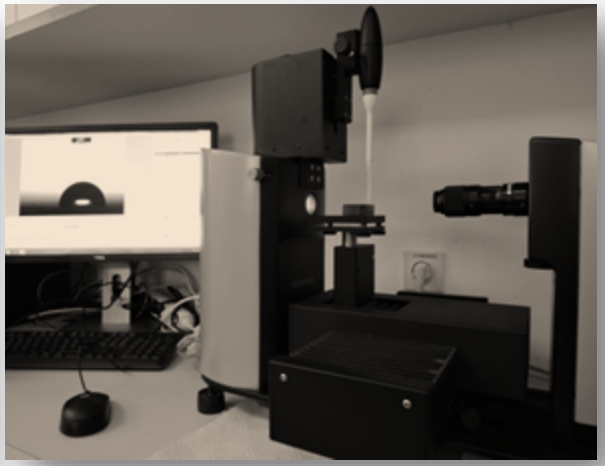
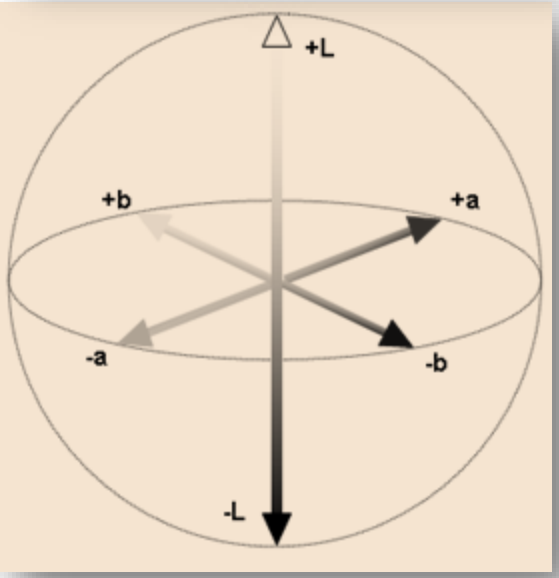
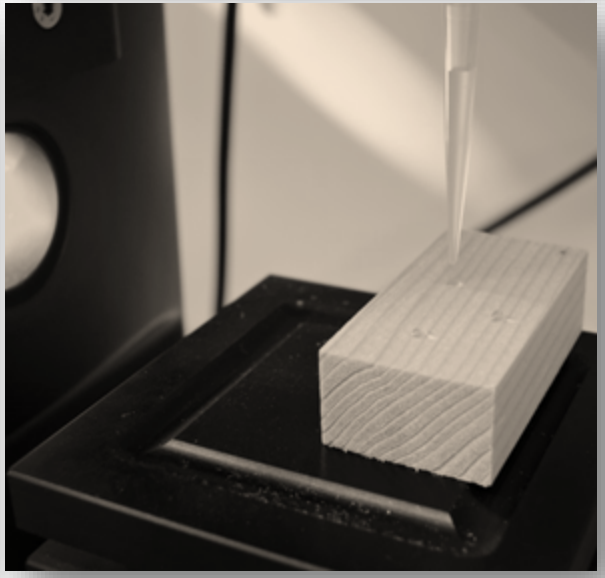
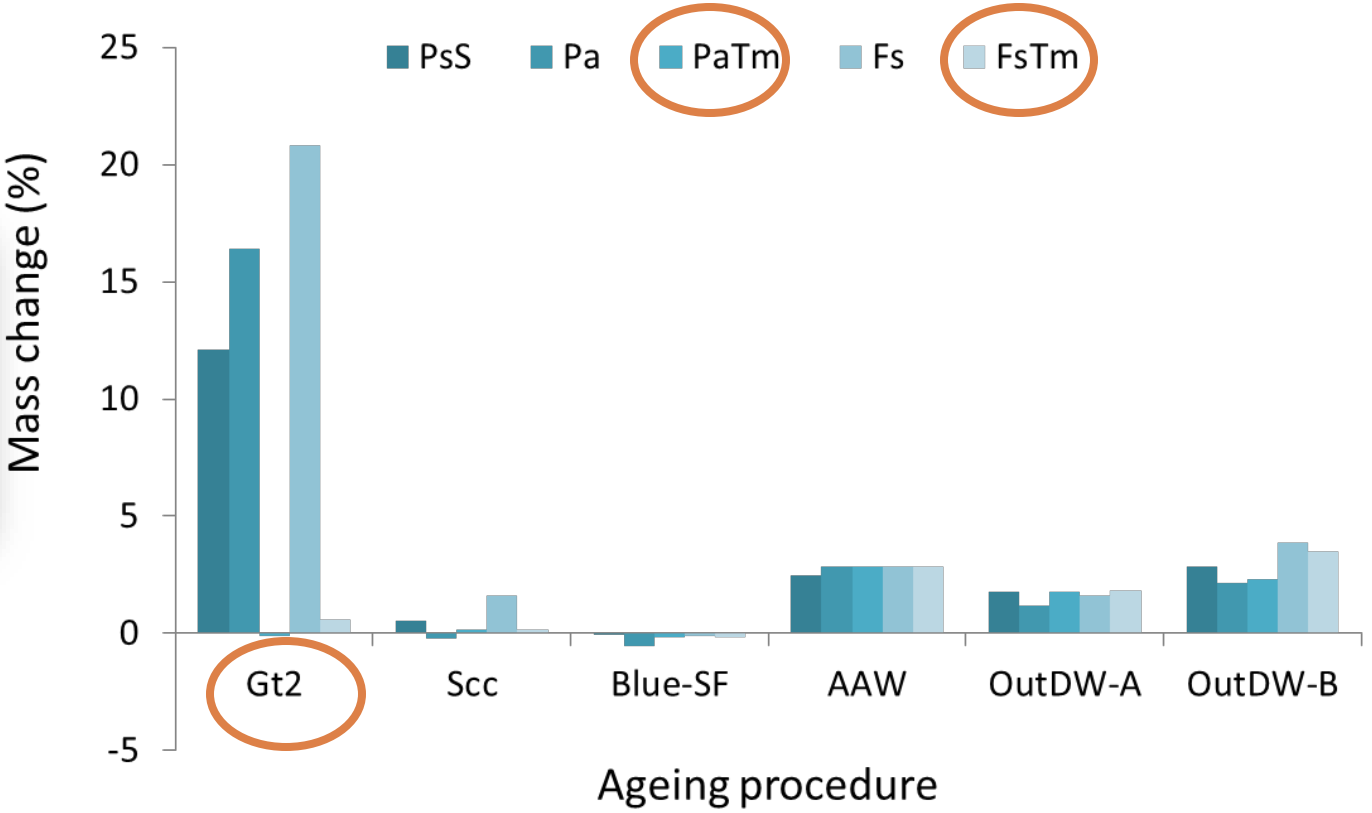




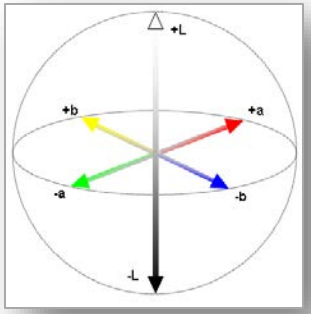


RESULTS



Mass change after exposure to different ageing procedures performed.

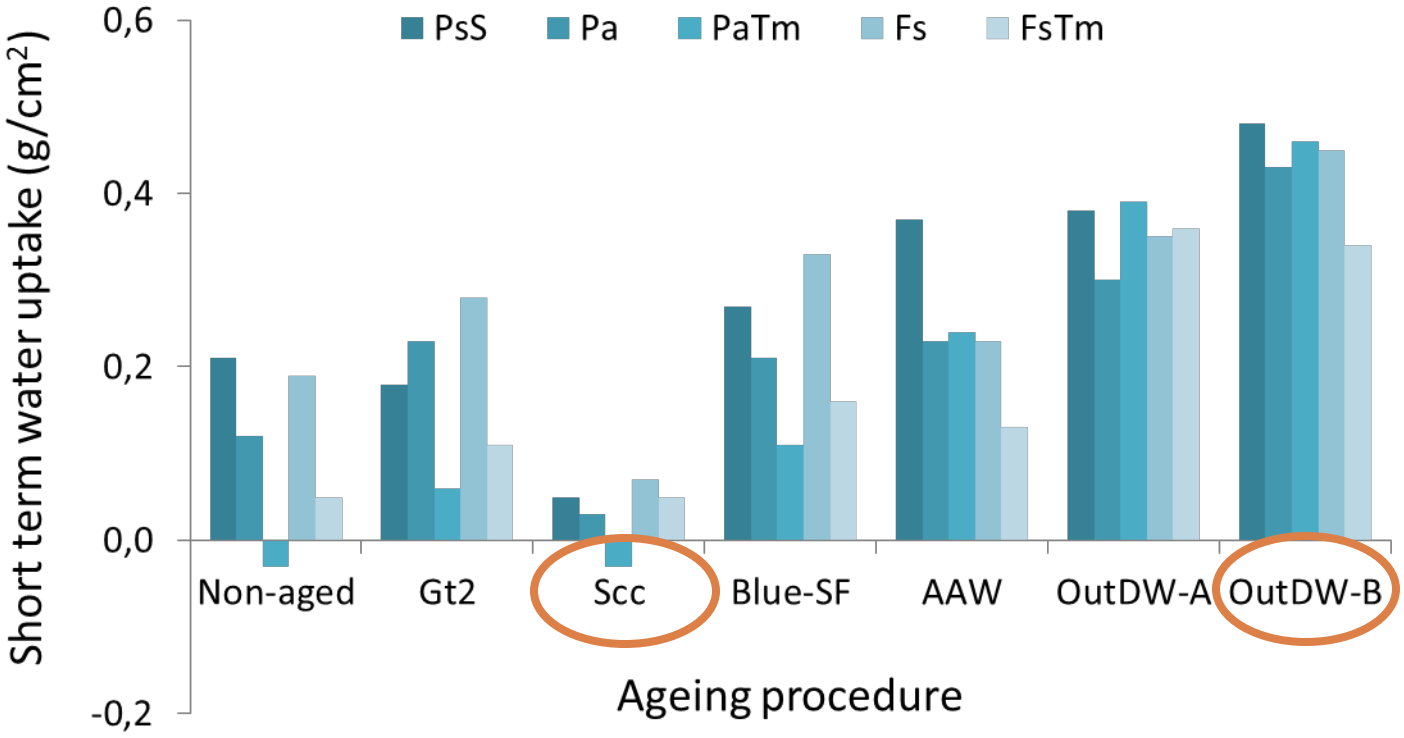
RESULTS



Colour change after exposure to different ageing procedures performed

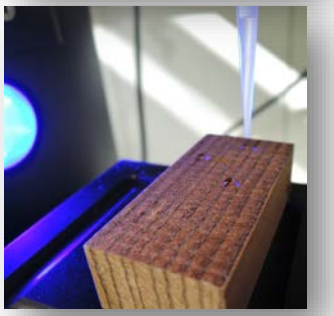
(OutDW-B is not included because the colour changes are similar to those of OutDW-A).

RESULTS



Short term water uptake measured with tensiometer after exposure to different ageing procedures performed.

RESULTS



Material	Non-aged	Gt2	Scc	Blue-SF	AAW	OutDW-A	OutDW-B
PsS	94 (64)	95 (64)	79 (45)	96 (70)	62 (15)	66 (0)	54 (0)
Pa	109 (93)	95 (39)	110 (94)	88 (55)	77 (37)	69 (16)	56 (0)
PaTm	103 (95)	93 (67)	94 (77)	82 (66)	44 (2)	70 (5)	72 (21)
Fs	76 (40)	99 (43)	85 (56)	73 (32)	54 (0)	82 (12)	68 (1)
FsTm	90 (65)	82 (48)	84 (61)	75 (40)	37 (0)	76 (14)	65 (3)

Contact angle (°) of water after 1 second and 60 seconds (in parenthesis) of drop deposition to surface after exposure to different ageing procedures performed.

CONCLUSION

- WEE can be improved with TM
- Abiotic degradation had a more prominent effect on WEE than biotic factors
- Abiotic and biotic factors of degradation also acted synergistically

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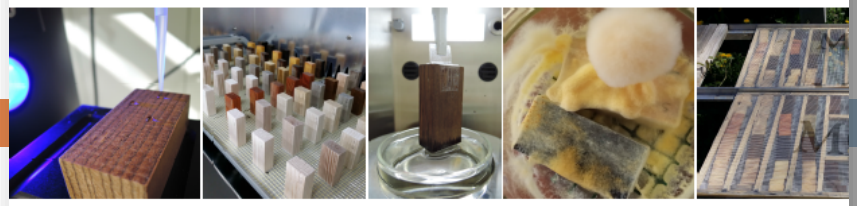

INTRODUCTION

In order to increase the use of wood in construction applications, more information related to service life and maintenance costs should be provided. Water exclusion efficacy (WEE) is one of the most important factors influencing service life and can be improved with modifications. The majority of past experiments were performed on the non-weathered wood. Therefore, the question arises how WEE changes within time. It is also important to know how the surface properties are changing, for the further use of recycled or reused wood.

MATERIAL AND METHODS

The wood species chosen for this research work are important in Central Europe, namely, Scots pine sapwood, PsS (*Pinus sylvestris*), Norway spruce heartwood, Pa (*Picea abies*), and beech, Fs (*Fagus sylvatica*) wood. Thermal modification (Tm) was performed according to the commercial Silvapro® process, 3 h at 230 °C for Norway spruce and at 215 °C for beech wood.

Four different aging procedures were applied:
- Exposure to wood decay fungi (EN 113) for 1 month, brown rot (*Gloeophyllum trabeum* - Gt2) and white rot fungi (*Schizophyllum commune* - Scc)
- Exposure to blue stain fungi (Blue-SF) *Aureobasidium pullulans* and *Sclerophoma pithyophila* (EN 152-1) for 1 month
- Artificially accelerated weathering (AWW) was carried out in a chamber (ATLAS UP, Suntest XXL+) that was set at the most severe typical exterior conditions for 1000 h of exposure (EN/ISO 11341)
- Outdoor weathering in the field test site of the Dept. of Wood Science and Technology for 9 (OutDW-A) and 18 months (OutDW-B)

After exposure, the following step was wood characterization:
- Mass change was determined gravimetrically
- Colour changes were evaluated with the CIE L*a*b* system
- The sessile drop method was used for contact angle (CA) measurement on a Theta optical tensiometer (Biolin Scientific)
- Short term capillary water uptake was carried out on a Tensiometer K100MK2 device (Krüss) (EN 1609)

RESULTS

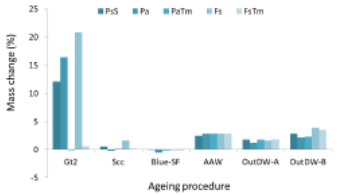

Figure 1: Mass change after exposure to different ageing procedures performed.

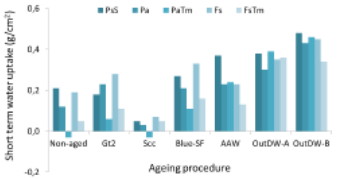

Figure 2: Short term water uptake measured with tensiometer after exposure to different ageing procedures performed.

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Table 1: Contact angle (°) of water after 1 second and 60 seconds (in parenthesis) of drop deposition to surface after exposure to different ageing procedures performed.

Figure 3: Colour change after exposure to different ageing procedures performed (OutDW-B is not included because the colour changes are similar to those of OutDW-A).

CONCLUSIONS

TM increased the CA determined on non-aged beech wood and decreased the CA of spruce wood. Abiotic degradation (artificial accelerated weathering) had a more prominent effect on WEE than biotic factors (wood decay and blue stain fungi). Abiotic and biotic factors of degradation also acted synergistically (outdoor weathered materials). After ageing, the CA of TM specimens are higher compared to non-treated material. WEE can be improved with TM.

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cost

THANK YOU FOR YOUR ATTENTION