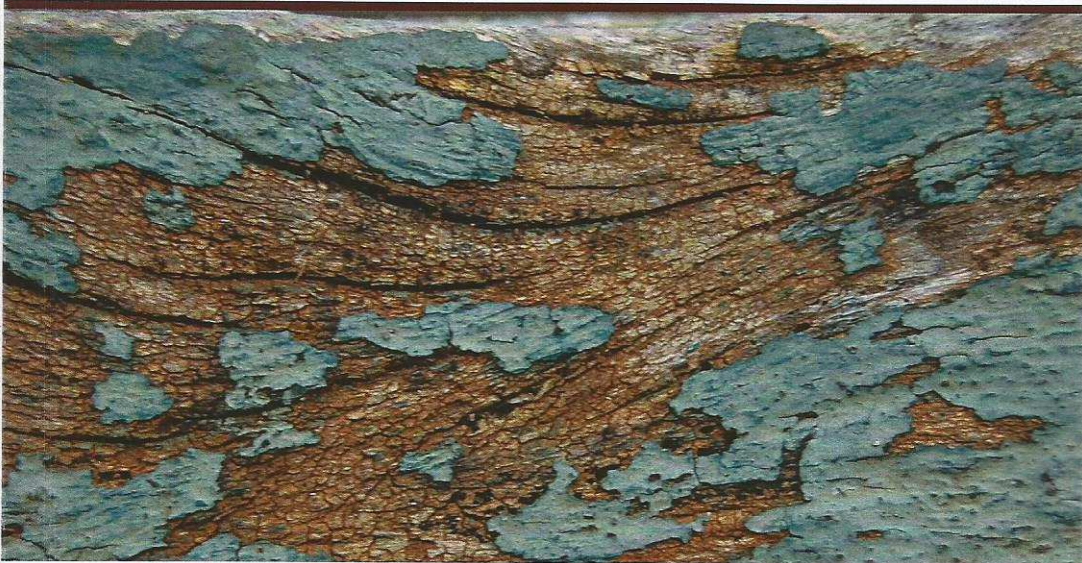


Mendel University in Brno

COST Action FPI407 2nd Conference



**Innovative production technologies and
increased wood products
recycling and reuse**



Editors: Andreja Kutnar, Matthew Schwarzkopf, Michael Burnard, Václav Sebera, Eva Troppová

Mendel University in Brno

COST Action FP1407

Understanding wood modification through an integrated scientific and
environmental impact approach (ModWoodLife)

**Innovative production technologies and increased wood
products recycling and reuse**

Second COST Action FP1407 International Conference
Brno, Czech Republic
29 – 30th September 2016

Editors: Andreja Kutnar, Matthew Schwarzkopf, Michael Burnard, Václav Sebera, Eva Troppová

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COLOUR CHANGES OF WOOD BY TWO METHODS OF AGING

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Wood is a natural, versatile, and renewable resource used worldwide for different uses. The use of wood in indoor and especially outdoor environments in architecture and construction, introduces it to adverse weather conditions that cause natural degradation, including photo degradation [1]. Among the damage caused by weather, like surface cracking, the product's properties are modified as well as its in service durability level. The *Pinus* forest area is large in Brazil and is intended for various sectors such as bio-energy, panels, and construction.

This study sought to compare outdoor weathering and accelerated weathering methods, in order to verify the effectiveness of the exposure methods to assess product durability. Natural weathering exposure is often used to observe the photo degradation of wood, but is very time consuming, requiring months of exposure. However, using an accelerated weathering method allows one to control the environment with simulated rain, dew, temperature, and irradiation allowing one to obtain results in shorter exposure times.

This study also aimed to characterise the colour change of wood of *Pinus* ssp. exposed to the action of natural weathering and accelerated aging. To achieve this, tests were performed at an outdoor location in the state of Rio Grande do Sul, Brazil. The wood was exposed in the first summer day so that exposure to UV light was the best possible in the first months of exposure. The accelerated aging test was conducted in a Model Bass chamber, according to ASTM G 154. The standard called for a 12 hour cycle consisting of 8 hours of light exposure at 60 °C, 25 min of condensation, and 3.75 h condensation at 50 °C. For the action of natural weathering, colorimetric measurements were performed every 90 days during the period of 9 months, for the accelerated aging test, the colorimetric measurements were performed every 30 hours for a period of 240 h in order to obtain the parameters CIE L*, a*, b*, and the variation of colour between the initial and final time (ΔE) was determined measuring the sample (ends and in the middle), according to the CIE Lab standard.

The results in the accelerated aging test showed significant darkening in the first 120 hours with decrease, after displaying a degree of stabilization of the L* parameter (Figure 1 and 2). While the parameters (a* and b*) are shown growing, with a stabilization after 120 hours.

The results of the natural aging test showed a significant change with reduction of parameters a*, b*, and L* in the first 180 days, after displaying a degree of stabilization of parameters.

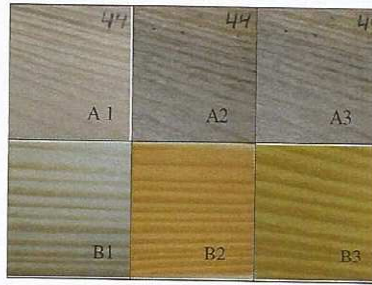


Figure 1: Effect of color changes of Brazilian *Pinus* wood exposed to natural weathering (A) with 0, 90, and 270 days respective and accelerated aging (B) with 0, 120, and 240 hours respectively.

The total colour change (ΔE^*) observed in accelerated aging was 17.5, while the natural weathering colour change was greater than 31.8. A greater ΔE^* value means a larger amount of colour change during the test. Both methods exhibit noticeable colour variations and are noticeable by eye when compared with non-exposed specimens.

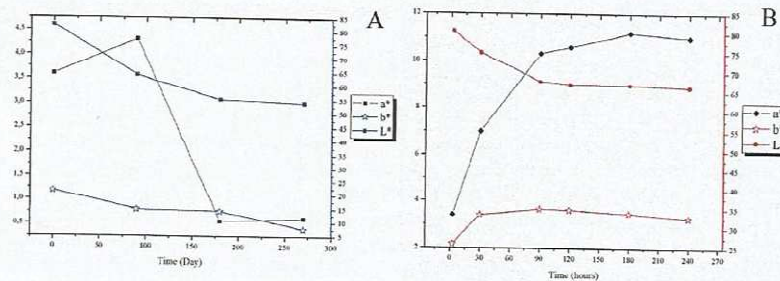


Figure 2: Changes in colour change parameters in Brazilian *Pinus* wood exposed to natural weathering (A) and accelerated aging (B).

Colour variations were observed during the time of exposure of wood for the two tests (natural aging and accelerated aging). Both methods caused significant discoloration of the wood, which showed a greyish colour as a function of exposure. Moreover, it is possible to observe that the accelerated test shows very similar results to the natural test, with the application of reduced times, this is due to high intensity UV light resulting in large discolorations of wood, with a very effective method to evaluate staining wood in outdoor service.

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