

Title: COLOURED ACETYLATED WOOD

5 **Field of the invention**

The invention relates to a process for the acetylation of wood, whereby the wood is subjected to colouring. Also, the invention relates to acetylated wood provided with a colouring agent.

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Background of the invention

Acetylation of wood has long been recognized as a method to
15 improve the durability of otherwise non-durable softwood species. Also, it is known as a method to improve wood properties, such as hardness, durability and dimensional stability.

Throughout the decades since 1928, various processes for wood acetylation have been proposed. A background reference pertaining to a
20 particularly suitable process is WO 2009/095687. Other references include EP 0 650 998, EP 0 799 272, WO 2010/151320. The various acetylation processes are disclosed in connection with various wood species, such as radiata pine, beech, poplar, southern yellow pine, spruce.

After decades of studies, and the availability of wide varieties of
25 wood species, commercial developments have thus far been limited to few species, particularly pine, such as southern yellow pine and radiata pine. The latter, known under the brand name Accoya®, today is recognized as a gold standard in the art.

A great advantage of acetylated solid wood is that it allows outdoor
30 use generally without significant protective measures, such as coatings. The latter advantage evidently is applicable to the acetylated wood when used as

it comes. In fact, acetylated wood is generally praised for its natural wood colour. With the increased interest in acetylated wood for various applications, such as outdoor furniture, decks, doors, windows, the interest also increases in the availability of acetylated wood of different colours.

5 Painting acetylated wood for protective purposes, however, would go against one of the main benefits of acetylated wood, viz. that it can be used outdoors without coating it. In view hereof it has been proposed in the field, to provide coloured acetylated wood, by impregnating it with a colouring agent. This yields a wood material that provides the look and feel
10 of natural wood, yet with a desired colour, and without the necessity of coating it. This comes with the further advantage that regular polymeric components of paint, which would adversely contribute to the environmental impact of the wood products concerned, can be avoided.

 Background reference on colouring an acetylated wood include WO
15 2018/106923 and WO 2018/106925. Described are methods for colouring an acetylated wood by allowing a colouring medium to impregnate the acetylated wood provided in a chamber, followed by heating.

 A suitable example of an acetylated wood product coloured by providing a colourant into the wood, has been marketed as Accoya® Color.
20 The production of such coloured acetylated wood, however, comes with considerable challenges related to the impregnation process. Particular issues are colour uniformity (within a board) and colour distribution (between boards). An inadequate colour uniformity is observed, typically, by a broad spectrum of colour shade variation between samples of coloured
25 acetylated wood products, such as beams or boards. An inadequate colour uniformity and distribution manifests itself by a lack of or poor colouring in various locations of the wood product, which can be visible to the eye as showing white or light-coloured patches.

 The aforementioned issues result in a relatively high reject rate
30 during the production of coloured acetylated wood. This adversely impacts

the efficiency of the colouring production process, the costs involved, and it results in an undesirably high amount of wasted wood products. It would therefore be desirable to find a way to produce coloured acetylated wood with a better colour uniformity, a better colour distribution, or both.

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Summary of the invention

In order to better address one or more of the aforementioned
10 desires, the invention provides, in one aspect an acetylated wood product comprising at least one colouring agent within the wood, wherein the wood is of the species *Pinus taeda*.

In another aspect, the invention presents a process for the
production of coloured acetylated wood, the process comprising providing
15 wood and subjecting the wood to a wood acetylation treatment and a wood colouring treatment, said wood colouring treatment comprising subjecting the wood to impregnation with a liquid comprising a colouring agent so as to provide impregnated wood, optionally followed by heating, and removing liquid from the wood, such as by evaporation, wherein the wood is of the
20 species *Pinus taeda*.

In still another aspect, the invention provides a process for the
production of coloured acetylated wood, particularly by colouring acetylated wood, the process comprising providing acetylated wood; subjecting said wood to impregnation with a liquid comprising a colouring agent so as to
25 provide impregnated wood; removing liquid from the wood, such as by evaporation, wherein the wood is of the species *Pinus taeda*.

In a further aspect, the invention resides in the use of wood of the species *Pinus taeda* for producing coloured acetylated wood.

In yet another aspect, the invention provides the use of wood of the
30 species *Pinus taeda* by subjecting said wood to acetylation, for the purpose

of producing an acetylated wood that is coloured by impregnation with a pigment dispersion, preferably an aqueous pigment dispersion.

5 Detailed description

The invention is based on the judicious insight of selecting wood of the species *Pinus taeda*, for producing acetylated wood having suitable properties for impregnation with a colouring agent. Particularly, wood of the species *Pinus taeda*, which is commonly referred to as loblolly pine or taeda pine, exhibits better colouring properties than radiata pine. This is unexpected, also in view of the fact that radiata pine and loblolly pine exhibit similar properties with respect to their ability to be acetylated.

The invention is defined with reference to an acetylated wood product comprising at least one colouring agent within the wood. The colouring agent being within the wood serves to distinguish the colouring agent applicable to the present invention from any colouring agent that might be present in a coating or paint or otherwise applied from the outside. The wood of the present invention is coloured specifically by impregnation with a colouring agent. A colouring agent can generally be any colorant, and particularly a dye or a pigment. A dye generally is a soluble colorant, whilst a pigment generally is a coloured substance that is completely or nearly insoluble in water or solvent, and is thereby provided as a dispersion. In most instances, dyes are organic compounds. Dyes include acidic colourants. Pigments can be inorganic or organic compounds; frequently, pigments are inorganic compounds. Pigments can be ionic compounds or neutral compounds.

Since the colouring agent is applied by impregnation, it is provided comprised in a suitable liquid carrier, preferably an aqueous liquid, more preferably water with a cosolvent, more preferably water with 0-10% w/w

cosolvent. A dye generally is water-soluble, and will be applied in the form of an aqueous solution. Pigments will be applied by impregnating the wood with an aqueous or solvent based dispersion. Preferably, the colouring agent is provided in the form of a dispersion of a pigment in water. Preferably, such dispersion has a pigment concentration of 0,1 to 10 % w/w, more preferably 0,2-8% w/w.

Preferably the liquid carrier employed is largely aqueous and the colorant(s) employed are essentially insoluble in this liquid medium so that the resulting colouring medium is in the form of a particulate dispersion of colorant(s) in the chosen liquid medium. In this implementation the colorants are chosen from the classes of colorant defined by Colour Index International as Pigments (including organic pigments, inorganic pigments and Lakes), (Disperse Dyes, Vat Dyes and Sulfur Dyes and either a single colorant or multiple colorants from within the same Colour Index class or either single or multiple colorants from two or more different Colour Index classes can be used. The selection of suitable colorants includes, but is not limited to: [C.I Pigment Yellows 1, 3, 34, 35, 42, 53, 73, 74, 83, 93, 97, 109, 110, 120, 128, 135, 150, 151, 154, 138, 155, 139, 170, 175, 180, 181, 183, 184, 191, 194, 213], [C.I. Pigment Oranges 20, 36, 38, 43, 62, 64, 66, 71, 72, 73, 78, 82], [C.I. Pigment Reds 31, 48, 48.1, 48.2, 48.3, 48.4, 101, 104, 108, 112, 122, 123, 144, 146, 149, 166, 168, 170, 175, 176, 177, 178, 179, 184, 185, 187, 188, 190, 202, 208, 224, 242, 254, 255, 264, 265, 266, 268, 269, 275], [C.I. Pigment Violets 19, 23, 28, 32], [C.I. Pigment Blues 15.1, 15.2, 15.3, 15.4, 15.5, 15.6, 36, 60], [C.I. Pigment Greens 7, 8, 17, 36, 50], [C.I. Pigment Browns 23, 25, 38], [C.I. Pigment Blacks 7, 11, 26, 28], [C.I. Disperse Yellows 23, 42, 54, 64, 82, 114, 211], [C.I. Disperse Oranges 25, 29, 30, 44, 61, 73, 76], [C.I. Disperse Reds 50, 53, 55, 59, 60, 73, 74, 82, 91, 146, 153, 167, 179, 190, 343, 364], [C.I. Disperse Violets 26, 28, 31, 33, 63, 73, 77, 93], [C.I. Disperse Blues 56, 60, 72, 73, 77, 79, 87, 143, 148, 165, 183.1, 257, 359, 360, 367], [C.I. Disperse Browns 1, 1.1, 19, 27], [C.I. Vat Yellows 1, 33], [C.I.

Vat Oranges 1, 2, 3, 9], [C.I. Vat Reds 1, 10, 13, 14, 15, 29, 31, 54], [C.I. Vat Violet 1], [C.I. Vat Blues 4, 6, 13, 14, 15, 18, 20, 43], [C.I. Vat Greens 1, 3, 8, 9, 13], [C.I. Vat Browns 1, 3, 68, 72], [C.I. Vat Blacks 8, 9, 25, 27, 29, 38], [Solvent Yellows 16, 163, 193, 232], [Solvent Red 242], [Solvent Violet 11],
5 [Solvent Blues 36, 63, 78, 97, 102], [Solvent Green 3], [C.I. Sulphur Yellows 2, 9], [C.I. Sulphur Orange 1], [C.I. Sulphur Red 6], [C.I. Sulphur Blues 5, 7, 13, 15], [C.I. Blacks 1, 6], [C.I. Sulphur Green 6], [C.I. Sulphur Brown 10].

A preferred colouring agent is an aqueous carbon black based pigment dispersion, such as EFI/Rialco AWC1 grey pigment dispersion.

10 The final pigment or dye-loading of the coloured wood is typically depending on pigment/dye extinction coefficient and concentration. Preferable the pigment loading of the wood ranges from 0,05 to 10% w/w, more preferably from 0,05 to 5% w/w.

The impregnation can be conducted by an impregnation method
15 known to the skilled person in the field of wood impregnation, such as a Lowry or Bethel process. Generally, the pigment concentration will be chosen at the higher end in the event of a Lowry process, which involves forcing an impregnation fluid into the wood under pressure. Similarly, a Rueping process can also be used.

20 Typical impregnation conditions (preferably at room temperature) for Lowry type process comprise, consecutively: fluid filling at atmospheric pressure, impregnation pressure 12.0 Bara for 15 to 30 min, removal of liquid, and a final vacuum at 0.13 Bara for 20 to 25 min.

Typical impregnation conditions (preferably at room temperature)
25 for a Bethel type process comprise, consecutively: a pre-vacuum at 0.15 Bara for 7 to 15 min, fluid filling while applying vacuum, an impregnation pressure of 12.0 Bara for 15 to 30 min, removal of liquid, and a final vacuum at 0.13 Bara for 20 to 25 min.

The impregnation process is preferably designed to fulfil the
30 following deliverables: a fluid uptake of between 250 and 700 litres per m³ of

wood (depending on process of choice); a pigment dispersion penetration throughout the wood product; an even penetration and retention throughout the height, width and length of the stacks. With wood of the species *Pinus taeda*, this can be achieved more easily than with radiata pine.

5 In a generally preferred embodiment, the impregnation comprises placing the wood in a vacuum chamber, optionally applying a pre-vacuum to draw air from the wood, adding the liquid comprising a colouring agent to the chamber while optionally retaining the wood in said chamber under vacuum so as to fill the chamber with liquid; increasing the pressure of the
10 chamber filled with liquid to above atmospheric pressure for 1 – 180mins; reducing the pressure so as to provide impregnated wood; and finally removing the excess liquid from the chamber and optionally applying a final vacuum.

 After the colour impregnation step, the resulting product is kiln
15 dried at typically (but not limited to) 60 – 80 °C to remove the water used during the colouring process, preferably but not necessarily down to a moisture content of 8% or below. This generally takes between 3 and 18 days depending on kiln loading, liquid-uptake and kiln configuration, and wood size.

20 In the field of wood acetylation, generally two types of substrates for acetylation are distinguished, viz. solid wood and wood elements. The latter refers to smaller pieces of wood, generally ranging from larger elements, such as chips or strands, to small elements, such as fibres. The term “solid wood” is generally employed to indicate relatively large wood
25 forms, such as beams or boards. Another representative relatively large wood form is that of veneers. Whilst essentially thin in one dimension (thickness), veneers come in relatively large dimensions of length, and possibly width.

 The *Pinus taeda* wood product disclosed herein is typically a solid
30 wood product or a veneer. Apart from practical considerations known to the

skilled person, such as the availability of sufficiently large equipment, the wood can have any size. The solid wood (*e.g.*, boards/planks) or veneers of wood of this invention preferably has a length or width of at least 8 cm. The thickness preferably is at least 1mm. In some embodiments, the wood has a
5 width of 2 cm to 30 cm, a thickness of 1 cm to 16 cm and a length of from 0.5 to 6.0 m. In other embodiments, the wood has a thickness of at least 1mm, a width of 10 cm – 25 cm and length of 1 to 6m.

The wood acetylation process by which the *Pinus taeda* wood is acetylated, can be a batch process, a semi-continuous process (such as a
10 process combining batch-wise feeding and continuous acetylation) process, or a continuous process. The acetylation of the wood of the invention is generally conducted in accordance with optimized acetylation processes as are known in the field. Preferred processes comprise the following steps:

- Providing wood (solid wood or wood veneers);
- 15 - Controlling, and if necessary adjusting, the moisture content of the solid wood or wood elements;
- Impregnating the solid wood or wood veneers with acetylation fluid;
- Subjecting the impregnated solid wood or wood veneers to one
20 or more heating steps in order to effectuate acetylation of the solid wood or wood elements;
- Separating the acetylated solid wood or wood veneers from excess acetylation fluid.

The acetylation process itself can be conducted, as known in the
25 art, using liquid and/or gaseous acetylation fluid. Typical acetylation fluids are acetic acid, acetic anhydride, and mixtures thereof. Preferably the initial acetylation fluid used is acetic anhydride, more preferably comprising a minor amount of acetic acid, generally 2 wt.% to 20% wt.%, such as 5 wt.% to 10 wt.%. As a result of the acetylation reaction, the composition of the

acetylation fluid will change during the process, since acetic acid is thereby formed.

In interesting embodiments, the acetylation is conducted in accordance with any one of the acetylation processes as described in
5 WO2009/095687, WO2011/95824, WO2013/117641, WO2013/139937, or WO2016/008995, the disclosures of which are herein incorporated by reference.

A preferred process, in WO 2009/095687. Herein a process is described for the acetylation of wood, comprising the steps of submerging
10 wood into an acetylation liquid in a reaction pressure vessel, conducting an impregnation procedure, removing excess acetylation fluid, introducing an inert fluid (typically nitrogen gas, the inert fluid possibly comprising non-inert acetic anhydride and/or acetic acid) into the vessel, circulating and heating the inert fluid following a heating regime so as to bring about
15 suitable acetylation of the wood, and removing the circulating fluid and allowing the acetylated wood to cool.

Another preferred process is that of WO2013/117641, which discloses an acetylation process that is suitable to achieve high acetyl contents in high density wood species, such as *Pinus taeda* (loblolly / Taeda
20 pine) and other southern yellow pine species. Herein the moisture content of the wood to be acetylated is controlled so as to be at a level of less than 5 wt.%, preferably 1-4 wt.%.

The acetylated wood obtained by the above methods has a high acetylation degree. In particular, it has an acetyl content of higher than 20%
25 by weight at its geometrical centre. Preferably, the acetyl content is higher than 21% by weight, more preferably, higher than 22% by weight, yet more preferably higher than 23 % by weight at its geometrical centre. In a preferred embodiment, the acetyl content of the acetylated wood is from 21 to 26 wt.% at its geometrical centre.

In order to determine the acetyl content of the wood, samples are ground to wood particles. From these samples residual trace amounts of acetic acid and/or acetic anhydride are removed, by washing with water and subsequent drying at $103\pm 2^{\circ}\text{C}$ for between 14-24 hrs. After weighing these
5 dried samples, the acetyl groups are released from the wood in the form of acetate ions by saponification with sodium hydroxide solution at elevated temperature. This saponification reaction runs for 4 hrs, with stirring every 15 minutes. The acetate ions are quantified by means of high-pressure liquid chromatography (HPLC), after calibrating this HPLC with standard
10 acetate solutions and using sodium butyrate as internal reference. This gives a direct measure of acetyl content that is preferred over general weight percentage gain (WPG) frequently used in other studies.

The invention also pertains to a process for the production of coloured acetylated wood, wherein the wood is of the species *Pinus taeda*.

15 The process comprises providing wood of the species *Pinus taeda* and subjecting the wood to a wood acetylation treatment and a wood colouring treatment. This process may comprise first subjecting the wood to colouring treatment, and then subjecting the resulting coloured wood to a wood acetylation treatment. Alternatively, the process may comprise
20 subjecting the colouring and acetylation treatments in parallel. Preferably, the wood is first subjected to acetylation treatment, and the resulting acetylated wood is thereafter subjected to the wood colouring treatment.

In all of these embodiments, the wood colouring treatment comprises subjecting wood of the species *Pinus taeda* to impregnation with a
25 liquid comprising a colouring agent so as to provide impregnated wood, optionally followed by heating, and removing liquid from the wood, such as by evaporation. In all of these embodiments, the acetylation treatment is preferably done by means of a wood acetylation process as described hereinbefore.

The wood colouring treatment as such can be conducted, e.g., in accordance with the processes as disclosed in WO 2018/106923 and WO 2018/106925, the disclosures of which are incorporated herein by reference. In a preferred embodiment, the liquid, i.e., the carrier liquid for the colouring substance or substances, is subjected to heating, before during or after impregnation. This is believed to aid in bringing about fixation of the colouring substance or substances to those surfaces and regions, exterior or interior, of the acetylated wood product which have been impregnated by said liquid carrier. The heating temperature will generally be 50°C up to the boiling point of the liquid, preferably water. Hereby it will be understood that temperatures above the atmospheric boiling point can be achieved at appropriate higher pressures. Accordingly, taking water as the preferred liquid, the heating will preferably be in a range of from 50°C to 160°C preferably 50°C to 140°C, more preferably 60°C to 120°C, most preferably 60°C to 100°C.

In the preferred embodiment of conducting the colouring treatment after the acetylation treatment, the process comprises providing acetylated wood. Said wood is thereupon subjected to impregnation with a liquid comprising a colouring agent so as to provide impregnated wood. Preferably the liquid is water, and more preferably the liquid comprising the colouring agent is an aqueous dispersion of a pigment, preferably as described above. It will be understood that the impregnated wood is an intermediate product, whereby the coloured wood is eventually obtained after removing at least part of the liquid carrier from the wood, in such a way as to leave in the colouring agent. Typically, such removal is by evaporation. In the event of having water as the liquid, the evaporation will typically involve drying, preferably kiln drying.

In a different aspect, the invention presents a new use of wood of the species *Pinus taeda*, viz. to produce coloured acetylated wood. Herein the wood of the species *Pinus taeda* is in producing acetylated wood by

subjecting said wood to acetylation, for the purpose of producing an acetylated wood that is coloured by impregnation with a liquid comprising a colourant, such as a dye solution or a pigment dispersion, preferably an aqueous pigment dispersion. Any and all embodiments described for the product and the process of the invention are applicable to the uses of the invention as well.

The coloured acetylated wood of the invention can be used in many applications, preferably outdoor so as to benefit from the properties of acetylated wood. Typical applications include joinery, decking and cladding. With reference to the colouring of the wood, applications possibly involving design desires are preferred, such as decking or outdoor furniture.

After the colouring process, planing of the product (coloured acetylated *Pinus taeda*) is performed to assess the quality/uniformity of the through-and-through colouring process. Typically, 0.5 to 2mm of the product is planed off.

In sum, coloured wood is disclosed of the species *Pinus taeda*, which is found to provide advantageous colouring properties. Also disclosed is a process for the production of coloured acetylated wood. Herein wood is subjected to a wood acetylation treatment and a wood colouring treatment. The wood colouring treatment comprises subjecting the wood to impregnation with a liquid comprising a colouring agent so as to provide impregnated wood, and removing liquid from the wood, such as by evaporation.

Working example 1 – colouring of acetylated *Pinus taeda*:

Pinus taeda boards of 25x250x2400 mm, sourced from Uruguay, have been acetylated according to WO2013/117641. The colouring process is performed in a typical pressure impregnation vessel. Prior to treatment with colour, the acetylated *Pinus taeda* boards are stacked in packs in which

the boards are separated using untreated softwood sticks or equivalent, to allow sufficient liquid and gas transport throughout the wood packs.

Then the acetylated wood is pressure treated with an EFI/Rialco AWC1 grey colourant in the standard high pressure timber treatment plant. An AWC1

- 5 working solution is prepared by mixing the AWC1 concentrate with water to a concentration of 6.5% w/w of the AWC1 concentrate in water. The solution concentration can be measured on-site using a spectrophotometer and is done after every mix. The impregnation is performed at 12 bara pressure for a period of 30min.

- 10 The impregnation process is designed to meet the following deliverables:

- An uptake of fluid of between 250 and 350 litres/m³ of wood
- Full penetration throughout the boards
- Even penetration and retention throughout the height of the packs

Following this colour treatment, the product is kiln-dried at 70 °C for 10

- 15 days to remove the water used during the treatment process, down to a moisture content of 8% or below while monitoring the moisture content.

For the kiln drying process, sticks of 19mm minimum thickness were used to allow sufficient airflow through the packs.

In the final step, the kiln-dried product is planed to visualise the difference

- 20 between uniform and non-uniform colouring. Typically planing is performed to remove the top 0.5 – 1.5mm of the wood surface.

The product showed good colour uniformity as visually assessed.

Comparative example – colouring of acetylated radiata pine.

- 25 Using the conditions of the working example but using acetylated New Zealand radiata pine as the wood source.

The product showed poor colour uniformity as visually assessed. It showed significantly higher variation in colour intensity on local level within and between the boards, compared to the *Pinus taeda* based coloured product.

Working example 2

- After acetylation, 28 boards of acetylated taeda pine (TP) 25x250 mm / 1.8 m have been subjected to colouring by subjecting the wood to impregnation
- 5 with a liquid comprising a colouring agent, EFI/Rialco AWC1 grey pigment. As a reference 25x200 mm boards of Accoya® radiata pine (RP) have been similarly coloured. The colouring involves impregnation either in a Lowry process or in a Bethell process.
- 10 After colouring the boards have been planed, and evaluated on colour evenness. From both wood species 4 boards have been randomly selected. Pictures have been taken with an iPhone Xs. The boards have been cut in such length that they fit on the scanner; Konica Minolta Bizhub C3351. The Heart side and Bark side of each sample is scanned into jpg (resolution
- 15 300x300 pixels). Subsequently, the scans are cropped and were evaluated on grey scale with a software program called 'ImageJ'. The histogram of grey scale of the image (ranging 0 to 255) has been made for each sample. The average colour and the colour variation (based on 5-95% percentile) has been calculated per sample.
- 20 The results of the evaluation per sample (of the bark side) on average and median grey scale and variation (based on 5-95% percentile) are summarised in *Table 1*.

Table 1. Results of the selected boards (Bark side).

Wood species	Colouring process	Board	Retention [kg/m ³]	Average grey scale	Median grey scale	Var. (5-95% perc)
TP	Bethell	8	14,0	97	98	29
		9	13,7	95	94	30
		10	14,8	97	96	34
		19	14,8	96	97	28
	Lowry	8	17,3	105	106	36
		9	18,6	102	102	39
		10	19,1	104	104	35
		19	17,2	105	105	34
RP	Bethell	3	14.2	99	93	58
		4	15.1	88	83	49
		18 / 81	20.2	67	65	25
		58 / 85	18.6	91	86	53
	Lowry	3	16.0	106	104	58
		4	17.6	98	95	53
		18 / 81	17.3	97	96	45
		58 / 85	16.3	101	97	58

Discussion of the results:

- 5 • For both wood species the darkness is a bit higher for the Bethell process compared to the Lowry process. For ACO taeda the average grey scale for the Bethell process is 95-97, and for the Lowry process 102-105.
- Darkest and most even colour is seen in the ACO NZ RP with the Bethell process (board 18).

- Difference in average grey scale, and most variation is seen in the ACO NZ RP boards with the Bethell process.
- Based on these 4 boards, the lowest difference in average grey scale and least variation within the board (5-95% percentile) is found for the ACO TP boards treated with the Bethell process, followed by the ACO TP boards treated with the Lowry process.
- In general the objective evaluation demonstrates a more uniform of colouring between boards and within a board of ACO TP for both the Bethell and Lowry process compared to the results for ACO NZ RP.

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Table 2. Summary of grey scale distribution of all 4 boards ACO taeda and ACO NZ RP for Bethell and Lowry process.

Wood species	Colouring process	Avg. Retention [kg/m³]	Average grey scale	Median grey scale	Var. (5-95% perc)
ACO TP	Bethell	14.3	96	97	30
	Lowry	18.1	104	104	37
ACO RP	Bethell	17.0	86	85	61
	Lowry	16.8	101	97	55

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Claims

1. An acetylated wood product comprising at least one colouring
5 agent within the wood, wherein the wood is of the species *Pinus taeda*.
2. An acetylated wood product according to claim 1, wherein the
colouring agent is a pigment or a dye.
3. An acetylated wood product according to claim 2, wherein the
colouring agent is a pigment selected from the group consisting of organic
10 pigments, inorganic pigments, and combinations thereof.
4. An acetylated wood product according to claim 3, wherein the
pigment is a carbon black pigment such as the EFI/Rialco AWC1 grey
pigment.
5. A process for the production of coloured acetylated wood, the
15 process comprising providing wood and subjecting the wood to a wood
acetylation treatment and a wood colouring treatment, said wood colouring
treatment comprising subjecting the wood to impregnation with a liquid
comprising a colouring agent so as to provide impregnated wood, and
removing liquid from the wood, such as by evaporation, wherein the wood is
20 of the species *Pinus taeda*.
6. A process according to claim 5, wherein the impregnated wood
is subjected to heating, during or after impregnation.
7. A process according to claim 5 or 6, wherein the wood
colouring treatment is conducted prior to or during the wood acetylation
25 treatment.
8. A process according to claim 5 or 6, wherein the wood
colouring treatment is conducted after the wood acetylation treatment.
9. A process for the production of coloured acetylated wood, the
process comprising providing acetylated wood; subjecting said wood to
30 impregnation with a liquid comprising a colouring agent so as to provide

impregnated wood; removing liquid from the wood, such as by evaporation, wherein the wood is of the species *Pinus taeda*.

10. A process according to any one of the claims 5 to 9, wherein the liquid is water or a mixture of water with an organic cosolvent.

5 11. A process according to any one of the claims 5 to 10, wherein the liquid comprising the colouring agent is a dispersion of a pigment in water or a mixture of water with an organic cosolvent.

12. A process according to claim 11, wherein the pigment is a carbon black pigment such as the EFI/Rialco AWC1 grey pigment.

10 13. A process according to any one of the claims 6 to 12, wherein removing liquid from the impregnated wood is conducted by kiln drying.

14. A process according to any one of the claims 6 to 12, wherein the impregnation comprises placing the wood in a vacuum chamber, optionally applying a pre-vacuum to draw air from the wood, adding the
15 liquid comprising a colouring agent to the chamber while optionally retaining the wood in said chamber under vacuum so as to fill the chamber with liquid; increasing the pressure of the chamber filled with liquid to above atmospheric pressure for 1 – 180mins; reducing the pressure so as to provide impregnated wood; and finally removing the excess liquid from the
20 chamber and optionally applying a final vacuum.

15. The use of wood of the species *Pinus taeda* in producing acetylated wood by subjecting said wood to acetylation, for the purpose of producing an acetylated wood that is coloured by impregnation with a pigment dispersion, preferably an aqueous pigment dispersion.