accoya®

the strength within

Simply the best

Wood is good. The possibilities it offers can be seen wherever we look: as sturdy decks or decorative trims, winter fuel or stylish furniture, musical instruments or industrial structures, window frames or walking sticks. Wood is a material that is both aesthetically appealing and endlessly practical. It is also our only naturally renewable construction resource.

The natural beauty and versatility of wood are fundamental to its universal popularity. When properties such as high strength, light weight and good insulation are required, wood becomes the ideal choice for many applications. Unfortunately, these compelling attributes are offset by the susceptibility of many wood species to deterioration, particularly when used outdoors.

Historically, the use of inherently durable tropical hardwoods and the application of toxic chemicals to temperate climate woods have provided partial solutions to this shortcoming. Metal salts treatments, while enhancing durability, do not improve wood's dimensional stability; plus, they create a disposal problem.

If an alternative existed which offered all of the "wood is good" characteristics, was sourced from sustainable forests, had zero toxicity and provided dimensional stability and durability that exceeded even the best tropical woods, a perfect material would have been found.

Accoya® is a "new wood species", whose performance credentials have been extensively researched and repeatedly demonstrated. Accoya® wood has properties that match those of the best tropical hardwoods, yet is manufactured using a non-toxic treatment and wood from sustainable sources. In fact, it may seem too good to be true... but Accoya® really exists.

An extraordinary new wood species

Imagine a wood that's perfect for outdoor use, with the performance of the best tropical hardwoods and much more:

- Class 1 durability - the best available
- Outstanding dimensional stability which dramatically improves coatings adhesion and product performance
- Lasting for 50 years above ground and 25 years in-ground
- Retained natural strength and beauty, plus increased hardness
- Consistent supply from certified, sustainably managed forests
- Environmental compatibility - non-toxic, 100% recyclable and naturally renewable
- Consistent, measurable quality all the way through the wood, not just at the surface

Accoya® wood is the result of more than 75 years research and development that have brought together a long-established and extensively researched wood modification technique, acetylation, and leading-edge technology to create and make this extraordinary "new wood species" commercially available for the first time.

Accoya® wood is set to become the material of choice for exterior applications and can be used for virtually anything, from windows to doors, decking to siding and even for applications which are presently only feasible with non-sustainable materials.

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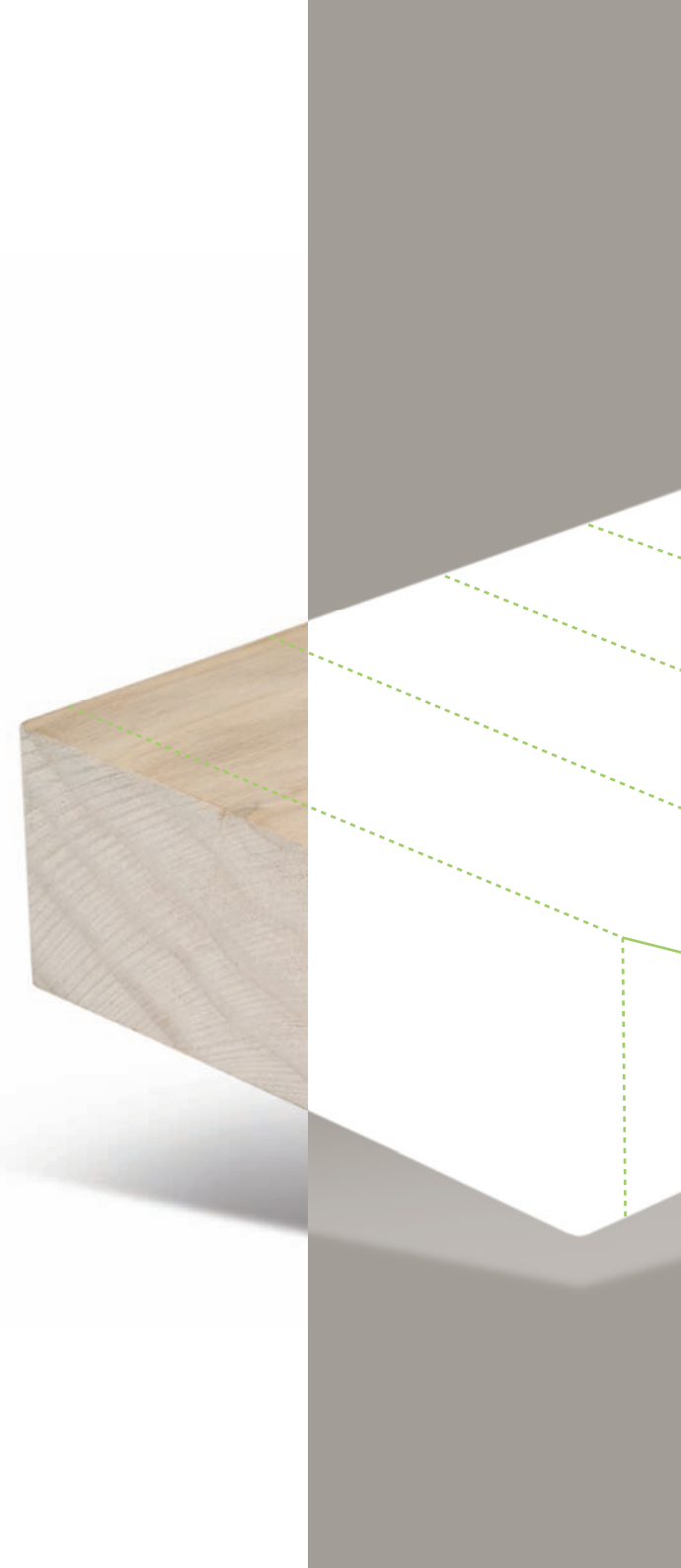
Performance through and through

Accoya® wood is modified all the way through, not just at the surface layer like many alternative treatments. This modification technique has two key advantages:

1. Users of Accoya® can have absolute confidence in the wood's durability in a way that has not previously been possible. Accoya® wood's durability is validated in a laboratory after the process has taken place. Using an array of sophisticated and proven analytical techniques, Accoya® wood's producers ensure that every batch is of consistent quality and reaches the highest possible performance standards.

2. When Accoya® wood is cut or jointed there are no exposed non-acetylated surfaces in any dimension. This completely negates the need to apply additional chemical preservatives on-site, as is necessary with unmodified or envelope-treated woods.



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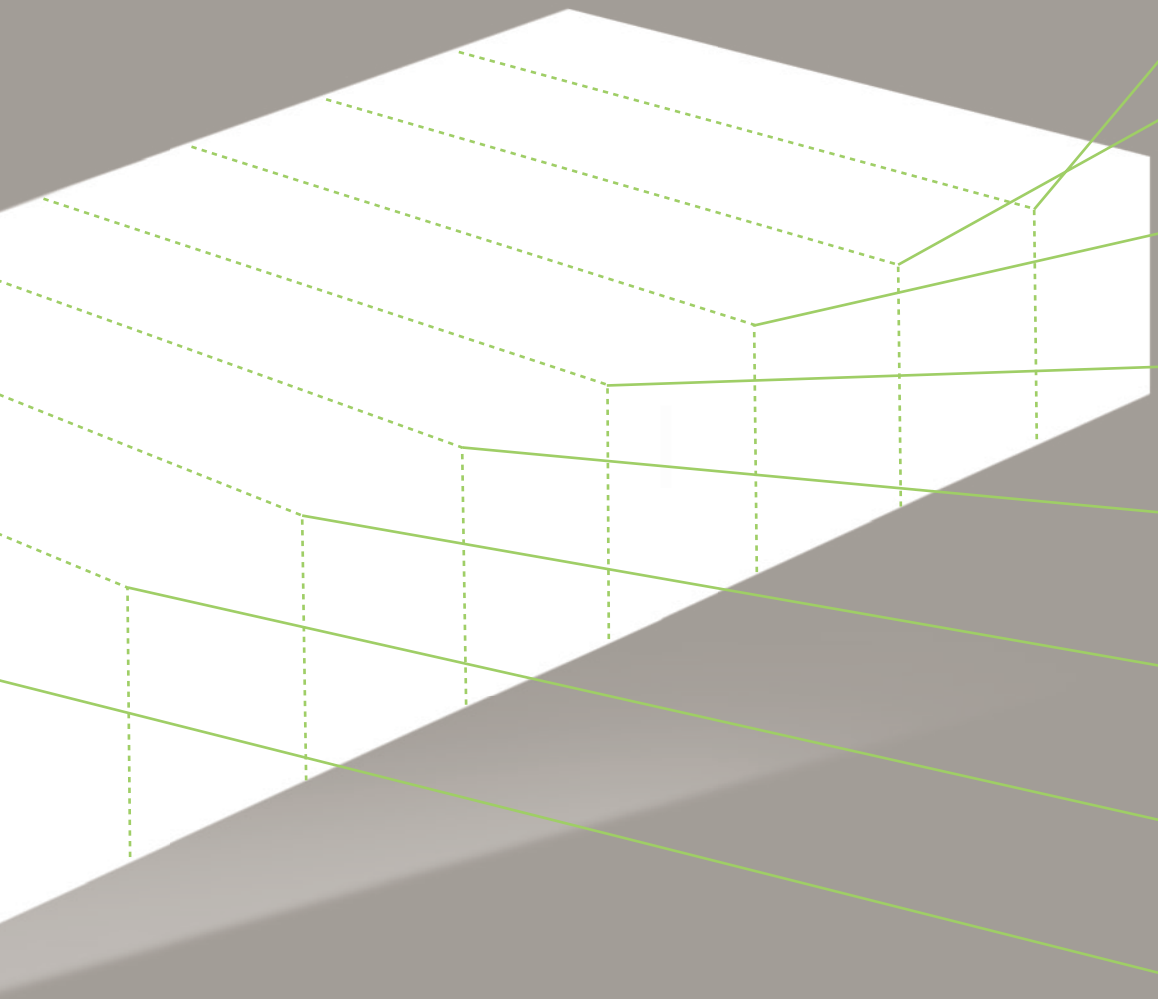


Dimensional stability
- swelling and shrinkage reduced by 75% or more
- doors and windows open effortlessly year round
- paints and varnishes last 3 or 4 times longer, greatly reducing maintenance costs

Class 1 durability
- the most durable wood possible
- more durable than teak
- perfect for outdoor use

Barrier to insect and fungal decay
- Accoya® wood is indigestible to insects and micro-organisms and is therefore not recognized as a food source
- durability to wood destroying fungi is dramatically increased
- Accoya® wood is virtually rot-proof

Machinability
- Accoya® wood is easy to work with and creates no challenges for product manufacturers and end users

Non-toxic
- Accoya® wood is non-toxic, protecting the environment from the harmful effects of treatment poisons leaching into the earth
- Accoya® wood may be safely reused and recycled

Resistance to UV degradation
- Accoya® wood has superior resistance to the effects of UV exposure, meaning that the wood's natural appearance is retained for longer
- Accoya® wood is the ultimate substrate

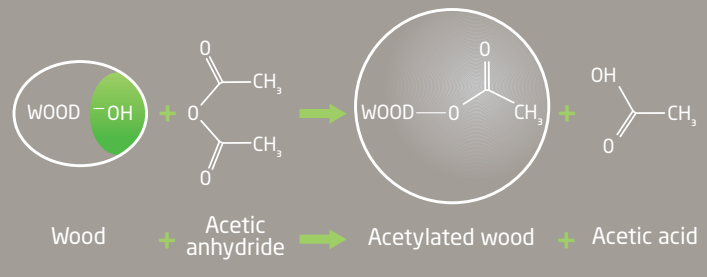
Naturally insulating
- Accoya® wood has reduced thermal conductivity
- Accoya® wood is ideal for windows and siding, where energy conservation is important

Strong and beautiful as nature intended
- the process does not compromise the wood's strength or natural beauty
- hardness is increased
- Accoya® wood's high strength to weight ratio makes it suitable for challenging external applications, such as traffic bridges

The Accoya® process under the microscope

Wood acetylation is a process that has been studied by scientists around the world for more than 75 years. This method of improving wood has been proven to deliver such superior performance that it has long been used as the "gold standard" against which other methods are measured. The Accoya® wood production process combines this work with years of proprietary research and investment to deliver consistent commercial-scale results.

The physical properties of any material are determined by its chemical structure. Wood contains an abundance of chemical groups called "free hydroxyls". Free hydroxyl groups absorb and release water according to changes in the climatic conditions to which the wood is exposed. This is the main reason why wood swells and shrinks. It is also believed that the digestion of wood by enzymes initiates at the free hydroxyl sites - which is one of the principal reasons why wood is prone to decay.



Acetylation effectively changes the free hydroxyls within the wood into acetyl groups. This is done by reacting the wood with acetic anhydride, which comes from acetic acid (known as vinegar when in its dilute form). When the free hydroxyl group is transformed to an acetyl group, the ability of the wood to absorb water is greatly reduced, rendering the wood more dimensionally stable and, because it is no longer digestible, extremely durable.

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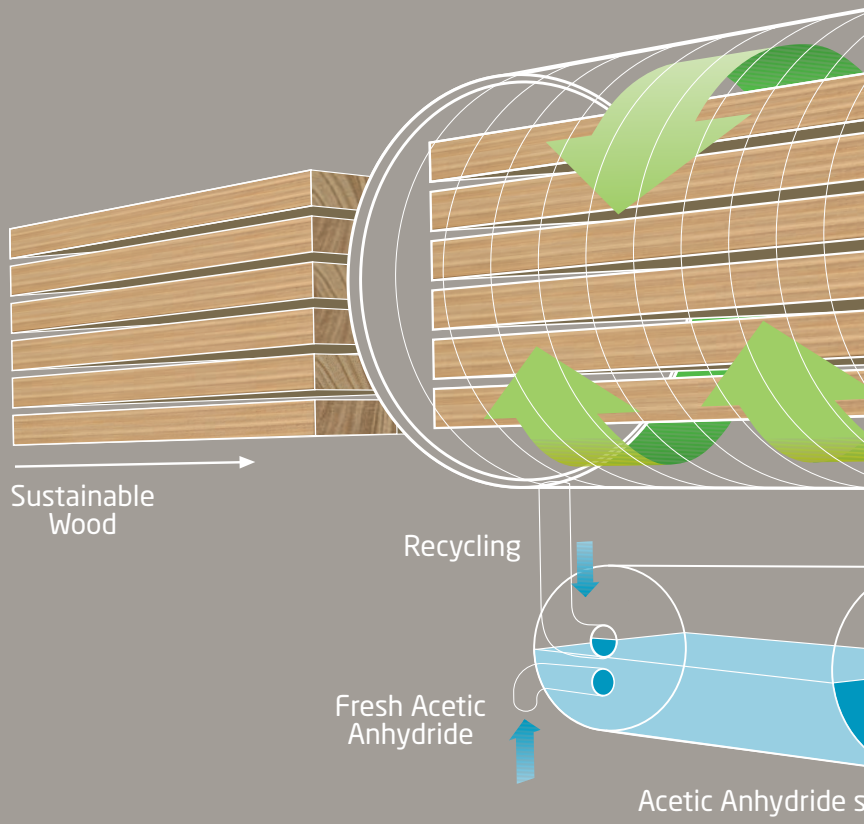

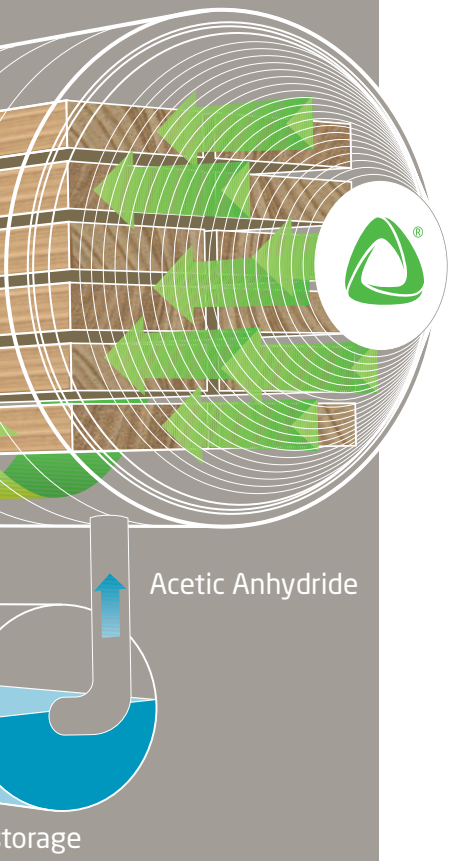

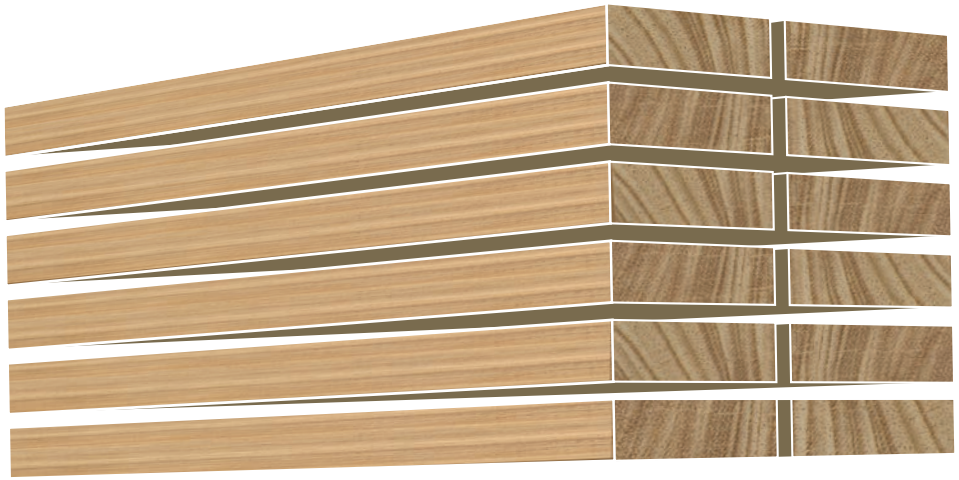

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Pure wood technology

Acetyl groups, which are simply comprised of oxygen, hydrogen and carbon, are already naturally present in all wood species – as well as in humans and other mammals. This means that the manufacturing process adds nothing to the wood that does not already naturally occur within it. The end product, Accoya® wood, does not add toxins to the environment. Incidentally, the only by-products from the manufacture of acetic anhydride are a small amount of valuable fertilizer and trace amounts of acetic acid, which can be reused.

The effect of altering the wood's chemical structure, as opposed to merely altering its chemical content, is essentially to create a "new species" of wood that is modified right through the cross section. By contrast, other comparable treatments merely insert chemicals (such as oils, ammonia or metal compounds) to the wood, improving durability but not dimensional stability.

Setting new standards in coating guarantees

Accoya® wood's exceptional qualities dovetail perfectly with recent developments in the way in which coatings, both opaque and transparent, can be applied and maintained. For example, close collaboration with Sikkens, part of the world's leading paint company, Akzo Nobel, has resulted in a package of coatings guarantees for windows and doors that is set to create a new industry benchmark. Trials are underway with other leading coating manufacturers to develop guarantees for their systems used in conjunction with Accoya®.

In many applications the frequency and cost of maintenance is a critical factor in determining the choice of material that is used. For designers, architects, builders and property owners, extended coatings guarantees reinforce the excellent natural performance attributes of wood – beauty, strength, thermal efficiency and machinability – and reiterate the enhanced performance attributes of Accoya® wood: durability, dimensional stability and reliability.

sikkens

THE SENTINEL WOOD PROTECTION PROGRAMME

30 year guarantee
in conjunction with the Sikkens Sentinel Plus® Wood Maintenance Protection Program

12 year guarantee
for an opaque, fully factory applied coating system to first brush applied maintenance

10 year guarantee
for a translucent (wood stain), fully factory applied maintenance coating system, to first brush applied maintenance

Tried and tested

Extensive laboratory and field testing by leading institutes around the world (including in New Zealand, USA, UK, Sweden, Malaysia, Indonesia, Russia, the Netherlands and Japan) has shown the performance of acetylated wood to be extremely reliable.

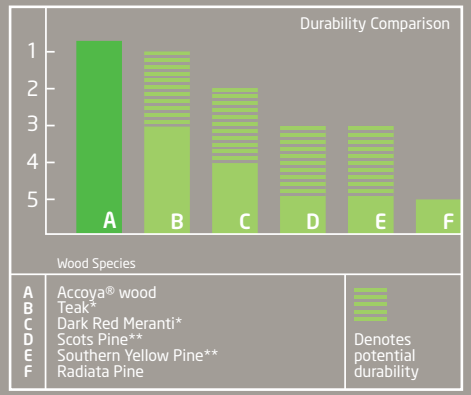
Accoya® has been thoroughly tested for dimensional stability, durability, UV resistance, paint retention and in-ground conditions to ensure optimal performance. Indeed, it is so reliable that for many years it has been and continues to be used by scientists as the benchmark against which other treatments and modification techniques are measured.

Wood species	Durability/ Class † (1 = highest)	Janka Hardness †† N/mm²	Bending Strength †† N/mm²	Radial Shrinkage between 60-90% RH	Tangential Shrinkage between 60-90% RH
Accoya® wood[1]	**1**	**3950**	**80**	**0.4**	**0.7**
Radiata Pine	5	3850	80	1.2	2.2
Scots Pine	3/4	2900	80	1.0	2.4
Beech (not steamed)	5	7100	115	1.2	2.5
Accoya® wood[2]	**1**	**6950**	**115**	**0.7**	**1.1**
Western Red Cedar	2	1450	55	0.5	1.2
Meranti (DRM)	2/3	4300	90	0.9	1.8
Sapele Mahogany	3	6700	105	0.9	1.2
Ponderosa Pine	3/4	3000	80	1.1	2.1

Comparison of the technical specifications of different wood species and Accoya® using various source species. Accoya® wood[1] based on a typical pine source material; Accoya® wood[2] based on beech source material.

† Based upon classification by EN350. Durability Class 1 corresponds to a 60-year service life in applications such as windows, doors, balconies and cladding in the British Standard recommendation BS8417.

†† Janka Hardness and Bending Strength are based on wood conditioned at 65% RH and 20°C. Values are heavily influenced by local growth conditions.



EN350-2. Classification Tests: EN113, EN252, ENV807
* Range caused by variability of species.
** Range caused by difference between Heartwood and Sapwood.

N.B. This graph shows the dimensional stability (volume metric) from fully soaked to oven dry (the most extreme laboratory test). Where a material is unaffected by moisture changes the dimensional stability would be 100%. This table does not show changes due to temperature conditions (wood is very stable). The main table on this page shows the shrinkage in more normal weather conditions (with simulated humidity varying between 60 and 90%).

Beauty that endures

Accoya® wood has superior resistance to UV degradation, with extensive tests demonstrating that the natural beauty of the wood lasts longer in exposed conditions. This, coupled with Accoya® wood's improved dimensional stability and excellent thermal properties, means that wooden windows, doors and siding can once again compete effectively with artificial alternatives.

Opaque coated acetylated (top) and unacetylated Scots pine after 5½ years outdoor test.

Dimensional stability

Accoya® wood offers dimensional stability (resistance to swelling and shrinkage) in both radial and tangential directions.

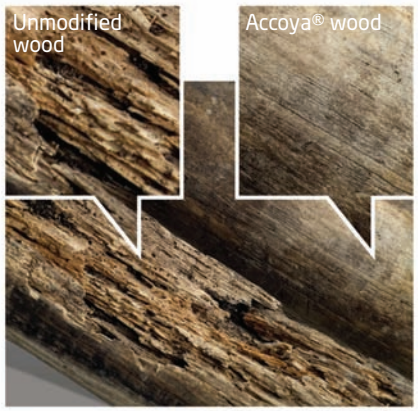
Tests have shown a reduction in swelling caused by moisture uptake of 70 to 80%, depending on the source species and conditions. From oven dry to water saturated conditions, the swelling and shrinkage of acetylated wood is only minimal and, in fact, better that the best tropical hardwood timbers available. Dimensional variability resulting from thermal changes (ambient or radiant temperature variations) is, like most woods, minimal.

Durability

Accoya® wood's durability is Class 1, matching and even exceeding the performance of nature's most durable woods. Durability is assessed by measuring weight loss over time in exposed conditions. Acetylation has been shown to improve durability to brown rot, white rot and soft rot significantly, with the percentage reduction in original mass being negligible compared to unmodified wood.

One of Accoya® wood's main advantages is that its key properties can be analyzed by standardized scientific measurements after modification, enabling its durability to be guaranteed.

Garden post: rot test



Wood for today, tomorrow...

Accoya® wood has been tested over prolonged periods in all types of weathering conditions - above ground, below ground and even in water – and has been proven to withstand even the toughest of external environments. Not only is its durability proven, but it has also been shown to retain its appearance, requiring much less frequent maintenance than other wood species. This gives added reassurance to the manufacturers, architects, specifiers, builders and property owners who have chosen Accoya® wood for a diverse range of projects. Accoya® wood is also being tested for additional uses by partners worldwide.

Window frames, doors & shutters

Accoya® wood is the material of choice for these products as it has low thermal conductivity and is more durable and dimensionally stable than the best tropical hardwoods. It may be opaque coated or, for those who enjoy the natural look of wood, transparent coated. Accoya® wood's low maintenance requirements add to its cost effectiveness and environmental credentials.

Cladding, siding & façades

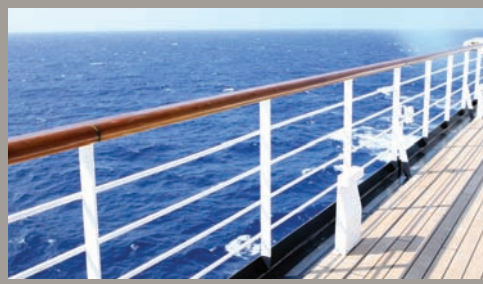
Accoya® wood is suitable for cladding, siding and façades where aesthetics, less frequent maintenance, dimensional stability and durability are key factors.

Decking

In specifying decking, natural beauty, strength and all-weather performance are important. A material that will stay flat and not warp, split, swell or be affected by rot is desirable. It is also crucial that the wood is non-toxic and therefore safe for people and pets. Accoya® wood meets these requirements.

Outdoor furniture & equipment

Accoya® wood is perfectly suited to tables, chairs, tree houses, play frames, planters and landscaping timbers as it is non-toxic and able to withstand the rigors of different weather conditions.



Imagination unlimited

Accoya® wood is already being used for many new and exciting applications, from heavy traffic road bridges to harmonica combs. Imagine Accoya® wood used in boat decks and trimmings, noise barriers, signage, veneers, high durability particleboards and fiberboards... Wherever you can imagine wood, imagine Accoya®.

FSC
The mark for products from well managed forests
CU-COC-807363
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All Accoya® wood is produced from well managed, sustainable sources, including FSC, PEFC and other regionally certified woods.

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...and the future

Against a backdrop of growing concern about the environmental impacts of the things we do and the materials we use, the popularity of wood - a versatile, beautiful material that's easy to use and easy to live with - is growing. It's not just good looks and charm that will ensure that wood plays a leading role in our future, but a number of other factors, too:

- Wood is a non-toxic, recyclable material
- Wood is light, yet strong and easily worked
- Wood offers good sound absorption properties
- Wood can be used as a bio-fuel at the end of its product life
- Wood is our only truly sustainable resource for construction
- Wood is a natural insulator and, as such, reduces energy used for heating
- Wood reduces the effect of global warming as trees and wood products act as carbon sinks
- Wood is sustainable and healthy; every cubic meter stores about 0.8 tons of CO_2

By using sustainably grown wood and improving its properties without adding toxins, Accoya® wood helps to protect threatened species and rainforests.

Accoya®... enhancing nature.

TITAN WOOD

the pioneers of accoya®

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