

DURABLE,  
STABLE &  
SUSTAINABLE







## WOOD WITHOUT COMPROMISE

The possibilities wood offers can be seen wherever we look: as furniture, decoration, musical instruments, structures - wood is a material that is aesthetically pleasing, endlessly practical and is our only naturally renewable building material. However, as an organic material that is susceptible to its surroundings, wood presents natural challenges when used for certain applications.

Historically, the only way to overcome these challenges was to treat the wood with the application of chemicals or to choose tropical hardwoods from rapidly diminishing forests - offering only partial solutions to the natural challenges that are faced when using wood as a construction material.

If an alternative existed which offered all of the best characteristics of wood, was sourced from sustainable forests, had zero toxicity and provided dimensional stability and durability that matched or exceeded even the best tropical hardwoods, an ideal material would have been found.

Accoya® wood is the solution.

FOR LATEST CASE STUDIES VISIT [ACCOYA.COM](http://ACCOYA.COM)



# IDEAL FOR WINDOWS, DOORS, CLADDING AND MORE

Accoya® wood is the result of decades of research and development that has brought together a long-established and extensively proven wood modification technique - acetylation - and leading-edge patented technology to create a high performance wood, ideal for outdoor use and challenging applications.

Accoya® wood has properties that match or exceed those of the best tropical hardwoods, yet is manufactured using a non-toxic process and uses wood from sustainable sources.

Already the material of choice for a wide range of demanding outdoor applications, Accoya® wood can be used for virtually anything from windows to doors, decking to cladding, bridges to boats and even for applications that are presently only feasible with non-sustainable and man-made materials.

Accoya® is the future of wood.





## ENABLING NATURE WITH HIGH TECHNOLOGY

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

- Using an array of sophisticated and proven analytical techniques, the producers of Accoya® wood ensure that every batch is of consistent quality and reaches the highest possible level in durability and dimensional stability versus the unpredictability of other choices
- 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



# THE PERFORMANCE BENEFITS

## DIMENSIONALLY STABLE



- 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 and the world's other most durable woods
- Perfect for outdoor use

## OUTSTANDING DURABILITY



- Warranted to last at least 50 years above ground and 25 years in ground

## INSECT BARRIER



- Accoya® wood is indigestible to insects and micro-organisms and is therefore more resistant to decay
- Barrier to wood-destroying fungi
- Accoya® wood is virtually rot-proof

## PERFECT FOR COATING



- Easier to coat: less preparation and sanding between coatings required
- Improved dimensional stability and UV resistance improves the life of coatings
- Perfect for transparent, translucent and opaque coatings

## NATURALLY BEAUTIFUL WOOD



- The process does not compromise the wood's natural beauty

## NATURALLY INSULATING



- Accoya® wood offers improved thermal insulation in comparison with commonly used wood species
- Accoya® wood is ideal for applications where energy conservation is important

## NON-TOXIC & RECYCLABLE



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

## FROM SUSTAINABLE SOURCES



- Sustainably sourced, including from FSC, PEFC and other regionally certified woods
- Naturally renewable

## UV RESISTANT



- Accoya® wood has superior resistance to UV degradation when translucent coated and its natural appearance lasts longer
- Accoya® wood is the ultimate substrate and coating life is increased

## RETAINED STRENGTH & HARDNESS



- The process does not compromise the wood's strength
- Hardness is increased
- High strength to weight ratio, making it suitable for challenging applications

## 100% RECYCLABLE



- Fully reusable and recyclable
- Reuse is recommended but Accoya® wood may be safely incinerated for bio-energy

## CONSISTENT QUALITY THROUGHOUT



- Consistent, measurable modification quality from surface to core
- No need to apply chemical preservatives when cut or planed

## EXCELLENT MACHINABILITY



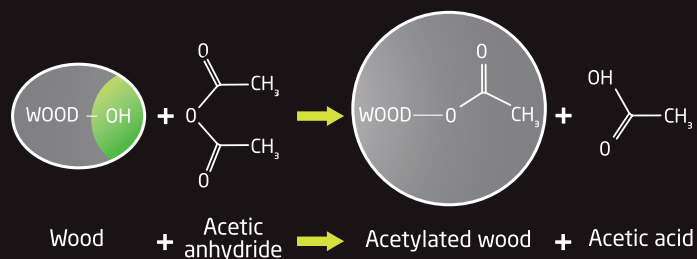
- Accoya® wood is easy to machine and process manually, creating no challenges for product manufacturers or end users

## CONSISTENT SUPPLY



- Produced from abundantly available, fast-growing sources species such as Radiata Pine

# ENABLING NATURE NATURALLY



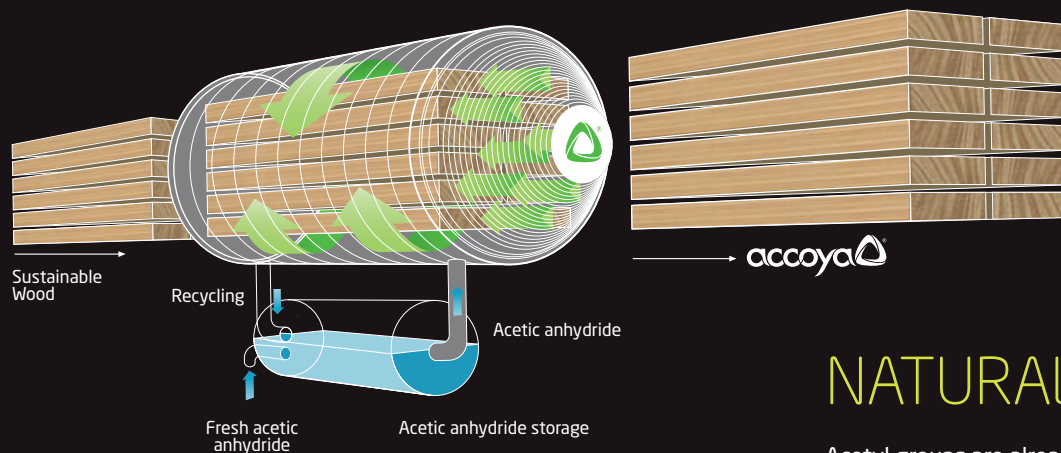
Wood acetylation is a process that has been studied by scientists around the world for more than 80 years.

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 patented production process combines this work with years of proprietary research and investment to deliver consistent results on a commercial scale.

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 (vinegar when in 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 extremely durable.



## NATURAL SCIENCE

Acetyl groups are already naturally present in all wood species. This means that the manufacturing process adds nothing into the wood that does not already naturally occur within it. The end product, Accoya® wood, does not add toxins to the environment.

The effect of altering the wood's chemical structure, as opposed to merely altering its

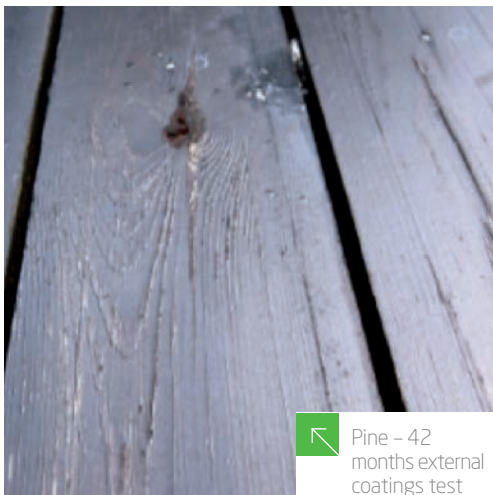
chemical content, is to create an end product that is dramatically superior to its source species. Accoya® wood is modified right through the cross section whereas, by contrast, virtually all other treatments merely insert chemicals (such as oils, ammonia or metal compounds) into the wood, improving durability, to a degree, but not dimensional stability.



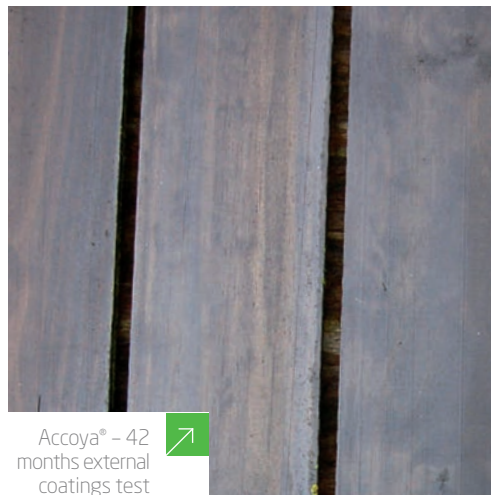
Scotland  
July  
2006



Scotland  
December  
2010



Pine - 42  
months external  
coatings test



Accoya® - 42  
months external  
coatings test



ASA treated  
L-joint



Accoya® -  
Acetylated  
L-joint

## LONGER LASTING COATINGS

Accoya® wood is the ultimate substrate, and its lower maintenance requirements add to its cost effectiveness and environmental credentials. Coatings may be transparent, translucent or opaque, allowing for more adventurous colour schemes that will endure.

All major coatings systems can be used on Accoya® wood, with significantly improved performance, due to the wood's outstanding dimensional stability and resistance to UV degradation. Extensive tests have shown that the natural beauty of Accoya® wood lasts longer, even in the most severe weather conditions.

## EXCELLENT COATINGS PERFORMANCE, TESTED BY TRADA

The translucent stain finish was seen to have remained fully intact over the 42 month outdoor exposure period on all the boards with no visible failures in evidence apart from where the coating had been broken by an end-fissuring. No evidence of any peeling of the stain coating was seen along fissures where they occurred. No evidence of mould colonisation was observed on any of the boards. Other competing cladding material coatings failed in the same tests with severe issues.

## ACETYLATED L-JOINTS OUTPERFORM ASA AND UNTREATED L-JOINTS AFTER 13 YEARS

A recent report conducted for Accsys by BRE (British Research Establishment) has provided excellent results for acetylated L-joints, further reinforcing the performance credentials of Accoya® wood. These are standard joints used widely in joinery and, for unmodified timber, the coating is prone to fail in the corner zone after several years service, largely because of the timber movement exerting stress on the joint.

A field trial using specimens to EN 330:1993 was exposed on 25<sup>th</sup> February 1998 with 3 modified timber L-joints acetylated at the University of Wales, Bangor, in 1995 and three ASA (alkenyl succini anhydride) treated L-joints. These were assessed after 5, 6, 9 and almost 13 years of exposure.

The acetylated L-joints performed significantly better than the untreated L-joints and those treated with ASA. After almost 13 years they only show discolouration (graded 1) whilst the ASA and untreated L-joints were severely attacked or failed (graded 3 or 4). This reduced scale test indicates that acetylated wood has potential for use in long life exterior joinery applications.

# 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, Germany and Japan) has shown the performance of acetylated wood to be extremely reliable.

Accoya® wood has been thoroughly tested for performance characteristics such as 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
<b>Accoya® wood</b>	<b>1</b>	<b>3950</b>	<b>80</b>	<b>0.4</b>	<b>0.7</b>
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
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 based on a typical pine 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.

## NATURALLY BEAUTIFUL WOOD

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 cladding/siding can once again compete effectively with artificial alternatives.

Opaque coated acetylated (top)  
and unacetylated Scots pine  
after 51 2 years outdoor test

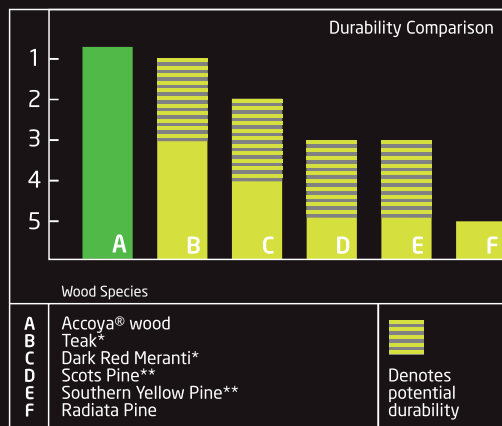


## DIMENSIONAL STABILITY

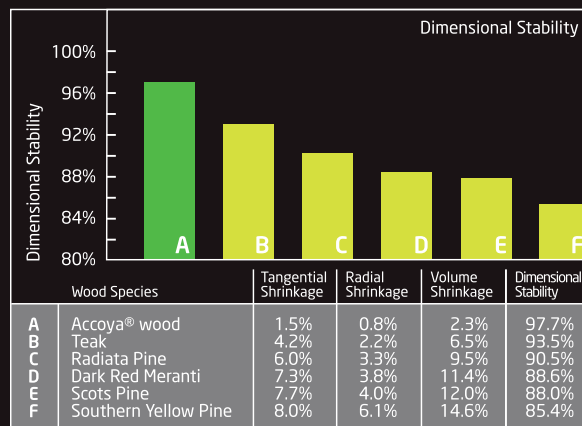
Accoya® wood offers dimensional stability (resistance to swelling and shrinkage) in both radial and tangential directions.

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 than tropical hardwoods. Dimensional variability resulting from thermal changes (ambient or radiant temperature variations) is, like most woods, minimal.





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 the previous page shows the shrinkage in more normal weather conditions (with simulated humidity varying between 60 and 90%).



## CLASS 1 DURABILITY

Accoya® wood's durability is Class 1, matching and even exceeding the performance of nature's most durable woods. Scion, formerly known as the New Zealand Forest Research Institute, has published a new report which concludes that Accoya® wood is more durable than four of the most naturally durable species. After six years of exposure in accelerated decay chambers and exterior ground contact tests, Accoya® wood was in much better condition than the cypress, cedar, kwila and teak when tested to the same rigorous standards. Radiata pine with copper chrome arsenate (CCA) treatment to the H3.2 and H4 New Zealand industry specifications for ground contact was also notably outperformed by Accoya® wood.





## THIS IS THE FUTURE OF WOOD...

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 leading independent institutes 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 more 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. Accoya® gives a wide range of coatings choices for unprecedented choice without compromising performance.

### FLOORING

Accoya® allows solid wood flooring in environments previously unthinkable such as wet areas and over-radiant heating without risk of excessive distortion.

### DECKING & MARINAS

In specifying decking, jetties and pontoons, beauty, strength and all-weather performance are important. A material that will not cup, bow, warp, split, swell or be affected by fungi, water uptake or rot is desirable. It is also crucial that the wood is non-toxic and therefore totally safe for people and animals. Accoya® meets these requirements, even in salt water splash zones.

### OUTDOOR FURNITURE & EQUIPMENT

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

### BRIDGES & CIVIL WORKS

With its high strength to weight ratio and overall superior performance, Accoya® allows wood to be used in demanding applications such as heavy traffic road bridges. Certain environments are particularly punishing and few are harsher than canal banks where wood is used to hold back the earth, exposing it to water, microbe rich soil and - most obviously at the waterline - air. Accoya® wood offers unparalleled performance in this application, replacing tropical hardwood.

### IMAGINATION UNLIMITED

Accoya® wood is already being used for many new and exciting applications. It opens up all kinds of creative possibilities and is inspiring architects and designers to look at new and different ways of using wood instead of manmade products, safe in the knowledge that their creations will be sustainable and long lasting. Wherever you can imagine wood, imagine Accoya® wood.





## ...THIS IS ACCOYA®

By significantly enhancing the durability and dimensional stability of fast-growing and abundantly available certified wood species, Accoya® wood provides compelling environmental advantages over slow-growing hardwoods (which are often unsustainably sourced), woods treated with toxic chemicals, and non-renewable carbon-intensive materials such as plastics, steel and concrete.

- The Accoya® wood patented modification process adds nothing to the wood that does not already naturally occur in it
- Class 1 durability - facilitating a longer lifespan, improved carbon sequestration potential and lower lifetime material consumption versus other materials
- Outstanding dimensional stability and improved hardness, resulting in lower maintenance frequency and therefore less coating over the lifetime of the product
- Superior thermal insulation, providing energy conservation advantages when used for applications such as windows and doors
- All Accoya® wood is produced from well managed sustainable sources including FSC, PEFC and other regionally certified woods
- Low carbon footprint: Accoya® wood is an environmentally compatible substitute for carbon intensive materials
- Environmentally compatible: 100% recyclable and reusable, naturally renewable
- Rapidly renewable materials: use of abundantly available and fast-growing source species

ACCOYA® WOOD... ENABLING NATURE



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