



**Preschem**  
SMARTER TIMBER PROTECTION

# DISCOLOURATION OF TIMBER

It's causes and how to prevent it.

Presented by: Rohan Baker

[www.preschem.com](http://www.preschem.com)

## Introduction to Preschem

- ▣ Preschem was founded in 1988 by two former CSIRO Timber Scientists.
- ▣ They developed a patented remedial preservative system to prolong the life of in service timber utility poles.
- ▣ They developed one of the original exterior decking oil and DIY preservatives available in Australia.
- ▣ The business group has expanded to include:
  - Radial Timber Australia (Yarram based timber mill)
  - Radial Timber Sales (Sales arm of the mill, Dandenong)
  - Outlast Timber (Trade/Retail of Australian durable hardwood timber, Mordialloc)
  - Heartwood Plantations (will eventually supply RTA with durable species sawlogs)

## Introduction and Background Pt 1

- ▣ One of the key visual appeals of timber is attributed to its colour.
- ▣ The colour is determined by the chemicals which act as the natural pigments in timber. This group of chemicals are known as polyphenolic compounds and quinones.
- ▣ Quinones are generally coloured, and polyphenolic chemicals are clear. This will become important later.
- ▣ These natural pigments are components of what are generically called “Extractives”.
- ▣ Extractives are all natural chemicals in timber that can be extracted with a solvent such as water

## Introduction and Background Pt 2

- ▣ Typically, the outer sapwood band is distinctly paler than the heartwood, except with lighter species like Radiata Pine or Blackbutt.
- ▣ The depth of colour usually indicates the amount of pigments within the timber.
- ▣ Another component of timber is lignin. Lignin is the natural glue that binds the cell walls of timber fibre together.
- ▣ Lignin is found in sapwood and heartwood
- ▣ The importance of lignin on the discolouration of timber will be discussed later.

## What causes discolouration of Timber?

There are three main areas that cause timber to discolour

1. Weathering, meaning the exposure to sunlight and rain. This is the main cause of timber discolouration
2. Staining due to natural or introduced causes
3. Chemical changes within the wood extractives

## Weathering

- ▣ Is the biggest cause of discolouration
- ▣ Exposure to rain leaches or bleeds out the extractives, including the quinones from the outer layer. This process lightens the timber
- ▣ UV, the more important cause of weathering, acts by:
  - breaking down the lignin into starches and sugars in the outer layer.
  - These starches and sugars acts as a food source for moulds which can be dark grey and blotchy.
  - Rain washes the starch and sugars away, leaving a silvery grey appearance.

## Staining

### Biological staining:

- ▣ Sapstain or bluestain moulds, which are dark blue-grey to almost black in colour
  - Damage is superficial
- ▣ Discolouration due to decay
  - Brown rot will turn the timber brown in addition to being destructive

### Man made staining

- ▣ Iron staining occurs when iron is introduced onto the timber, such as being sprayed by welding spatter or grinding metalwork, then exposed to water. The iron rusts leaving small black blotches. Iron Staining could also be considered to be a chemical change as it does react to some extent with extractives

## Chemical changes

- ❑ Oxidation of the polyphenolic compounds to quinones will cause the timber to darken. This is caused by simple exposure to air and UV.
- ❑ Exposure to light, even ambient light indoors can cause tannins to oxidise. This can create a yellowing of light coloured timbers over a very long time
- ❑ Introduction of alkali or acidic materials like glue or finishes can react unexpectedly with extractives
- ❑ Leeching of extractives can cause water marks on the timber, especially when freshly cut



## How to prevent colour changes? Pt 1

Now that you know the mechanism of what causes discolouration. Many of the preventative measures are self explanatory. But here is what can be done.

- ▣ UV Weathering is best prevented by using a timber finish that contains either a:
  - “Transparent oxide” pigment
  - Chemical UV inhibitor.
  - Pigments are more effective than chemical UV Inhibitors
- ▣ UV weathering cannot be halted, only delayed. These additives are like sunscreen. It won't stop you eventually being burnt, and you have to maintain it.

## How to prevent colour changes? Pt 2

- ▣ Preventing fungal decay or sapstain/bluestain mould involves using either a preservative that creates a chemically hostile environment for the biological organism

or:

- ▣ Using a finish that contains an anti-sapstain chemical in addition to controlling the moisture content of wood to under 20%. “Dry” timber won’t rot or develop saptain moulds

## How to remove unwanted colour changes?

- ❑ In the event of Iron Staining, the surface must be sanded back to remove the source of iron. To test that it has all been removed, wet the timber and wait 24 hours. If it reoccurs, repeat the process until it completely disappears.
- ❑ Heavy sapstain mould/UV weathering can be removed with a light sand. This should then be followed with an Oxalic Acid or Sodium Percarbonate based timber cleaner or Hypochlorite (eg pool chlorine or Napisan disinfectants.)
  - Note that oxalic acid cleaners work best when supplied in crystal form
  - Hypochlorites will bleach the timber, are very effective against mould, but relatively ineffective against UV weathering
  - Sodium percarbonates are not as effective as oxalic acid
- ❑ Light UV weathering is simply removed with Oxalic Acid or Sodium Percarbonate.