WOOD, COLORANTS, APPLICATIONS ON WOOD

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WOOD

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Biologically speaking, wood is made up of cells and fibres grouped into the various parts of the trunk:

- External bark : the protective outer layer
- Inner cortex or phloem : the layer beneath the external bark in which substances processed by the leaves circulate (processed lymph descending)
- Cambium : every year a layer of ligneous cells forms (growth rings) on the inside whilst phloem cells form on the outside
- Sapwood : the part of the trunk in which nutritional substances flow from the roots up to the foliage
- Heartwood : the structural part of the tree made up of dead sapwood cells
- Medullar ray : cellular system which develops radially, from the bark to the medulla pith, in which nutritional substances are transported and stored
- Medulla pith : the central part of the tree which stores reserve substances

Chemically speaking, wood is mainly made up of:

- cellulose, encrusted with a substance called lignin
- tannin substances
- sugars
- waxes
- resins

And a great deal of water: up to 45% !

When the wood is seasoned for a sufficiently long time – and in suitable environmental conditions – the water content falls to 20-30% and sometimes to as little as 10%.
For this reason wood is a living material: with changes in microclimatic temperature conditions, pressure, external humidity and light, wood absorbs and releases humidity, expanding and contracting continuously.
An understanding of this property of wood is essential when selecting the type of finish to adopt: when using finishes for outdoor use it is necessary to ensure that a sufficiently elastic film forms, adapting to changes in the dimensions of the piece of wood as well as to mechanical stress exerted by the wood.

COLOURING WOOD

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Introduction
Colorants can be found all around us as well as in commonly used objects. To safeguard our health and the environment it is important to use non toxic products, which are less dangerous and have less impact on the environment, in line with sound eco-friendly principles.
Colorants selected and formulated by **FIORIO COLORI** on the basis of stringent tests and in compliance with European Union regulations, not only meet the above requirements but can also guarantee:

Safety
Practicality
Reasonable Cost
Penetrating power

Wood is dyed in order to :

- Improve the appearance, enhancing the structure and grain
- Make the colour even
- Render ordinary types of wood more “prestigious”

The purpose of a finishing treatment is to protect the wood, increasing its useful life, preserving it from mould and mildew and bacteria etc and also attenuating the effects of solar radiation.

The colouring process can be carried out at the same time as finishing is performed with a protective film which may also be decorative; in other cases, the colouring phase is the only enhancement activity; alternatively it may precede the surface finishing phase, using transparent varnish. Colouring, which serves to heighten pre-existing characteristics of the wood should not be confused with painting which consists of covering the surface to be treated with an even coat of coloured film.

COLORANTS

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Substances which are able to impart colour to the substrate on which they are applied can be divided into:

- **dyes**: substances which become soluble in the medium in which they are applied
- **pigments** : they are made up of tiny insoluble particles which disperse in the medium to which they are applied

Pigments are employed in the formulation of paints. It is possible to use organic and inorganic pigments as well as earth pigments. Iron oxide and titanium dioxide are amongst the most widely used whilst earth pigments which contain heavy metals are used less frequently. Colorants are classified, on the basis of their origin into:

- natural
- synthetic

Natural Dyes

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Organic substances derived either from plants or animals: they are not as light-fast as synthetic dyes and have less staining strength, which can however be improved using chemical mordants such as ferrous sulphate, alum, potassium permanganate, potassium dichromate, stannous chloride etc.

Use:

- turmeric and saffron in yellow shades
- carmine and anthocyanin in red shades
- logwood in black shades

Synthetic Dyes

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The first synthetic dye was created in 1856 by PERKIN by means of oxidisation of aniline sulphate prepared from untreated tar. It is for this reason that the terms “aniline” or “aniline dye” are commonly used to distinguish synthetic organic dyes even though they no longer contain aniline or products derived from it.

Water soluble dyes

A range of synthetic organic dyes which are soluble in water and are characterised by excellent staining power and good light-fastness, both of which improve with further finishes.
Applying aqueous solutions tends to raise fibres in the wood, so in order to obtain a perfect polish it is often necessary to sand with fine sand paper.

Alcohol soluble dyes

A range of synthetic organic dyes which are soluble in ethyl alcohol and which are characterised by excellent staining power and high sheen. Experience is required as alcohol soluble dyes fix rapidly to the wood.

MORDANTS

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Natural mordants

KASSEL extract, a naturally derived extract formed by humification of plant substances; correctly treated and crystallised it is called WALNUT MORDANT.
It is made up principally of sodium salt from humic acid, water and earthy residue
When the walnut mordant is correctly formulated it is possible to obtain mahogany, ebony, rosewood and teak shades.
Naturally derived mordants, have good fixing strength on wood, enhancing the wood's characteristics, whilst they do not work well with other substrates such as leather: this represents a big advantage during application. Dripping can be removed by simply washing with water. This characteristic distinguishes natural mordants from synthetic dyes which stain the skin and are not easy to remove.
Often the term mordant is incorrectly used to denote synthetic dyes which are soluble in water or alcohol.

Inorganic mordants

Inorganic compounds able to modify and fix the colour of the wood and natural colorants.
They are usually metallic salts of iron, chromium, copper, manganese, tin etc. They are no longer used on account of their high levels of toxicity. In ancient times they were applied from aqueous solutions to darken wood and to enhance its grain.

COLOURING

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Before commencing colouring it is essential to ensure that the article to be treated is perfectly clean and even, using medium grit (150) or fine(240-280) sand paper and removing dust with a cloth which does not deposit fibres.
In the case of restoration work previous finishes must be totally removed, returning the wood surface to its original state.
The amounts indicated are purely suggestions as the intensity of the colouring depends on the type of wood: woods such as poplar and birch absorb colour easily whilst walnut and oak need more concentrated solutions in order to obtain the same shade.

Colouring with water soluble dyes

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Dissolve between 0,5 and 2 parts of colour in 100 parts of water according to the shade desired; the water should preferably be hot.
Check that the colour has completely dissolved and apply with a brush on a section which is hidden from view or on a piece of discarded wood so as to check the intensity of the colour.
Brush in the direction of the grain.
Before it dries make sure that the colouring is spread evenly using a damp sponge.
Allow to dry for at least 4 hours.
To obtain professional looking results it is preferable to repeat the colouring using steadily increasing concentrations.

Colouring with alcohol soluble dyes

Warning: ethyl alcohol is highly flammable. Solubilisation must be carried out in a double boiler away from all sources of ignition such as heat, flames, burners and electric motors

Dissolve between 0,25 and 1 parts of colour in 100 parts of 94° alcohol according to the shade desired.
Check that the colour has completely dissolved and attempt to paint on a section which is hidden from view or on a piece of discarded wood so as to verify the intensity of the colour.
Before it dries make sure that the colouring is spread evenly using a damp sponge.
Allow to dry for at least 2 hours.
Alcohol based colorants give bright tones and dry rapidly.

Colouring with mordants

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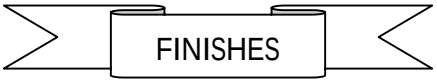
Dissolve between 2,5 and 7,5 parts of mordant in 100 parts of water according to the shade desired. The water should preferably be hot.
Allow to cool and decant or filter with a nylon stocking. Attempt to paint on a section which is hidden from view or on a piece of discarded wood so as to verify the intensity of the colour.
Paint in the direction of the grain.
Before it dries make the colouring uniform using a damp sponge.
Allow to dry for at least 4 hours.
To obtain professional looking results it is preferable to repeat the colouring using steadily increasing concentrations.
The prepared solution does not keep long: it is advisable always to decant it or filter it before use.



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The type of finish varies according to the use to which the manufactured article will be put as different conditions require different types of finish:

- ※ exterior finish: preservatives are used as they form an elastic film which protects the wood against bad weather, and direct sunlight.
- ※ interior finish: it is better to use products which allow the wood to breathe and which improve its appearance, enhancing its natural appearance.

In both cases the finish stabilises the colouring rendering it impervious to drops of water.
Below you will see the most commonly adopted finishing methods with several preparations included purely as suggestions. As an alternative to preparing the products oneself, professional products ready for use can be found in paint shops.

INTERIOR FINISHES

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Shellac finish

Shellac is a natural resin derived from animals which is easily soluble in 94-99° alcohol
It is a classic finishing system, widely used in the 19th Century to obtain a glossy transparent film.

Preparation:
Warning: ethyl alcohol is highly flammable. Solubilisation must be carried out away from all sources of ignition such as heat, flames, burners and electric motors.

Place in a 1 litre heat-resistant wide-mouthed glass bottle:
200 g. of shellac flakes
800 g. of 99° alcohol
Heat in a double boiler stirring manually every so often until complete solubilisation has taken place.
Allow to settle overnight and then decant or filter with nylon stocking so as to eliminate any remaining parts which have not dissolved: the honey coloured solution is ready for use.
The solution must be kept in the dark.
It is advisable to prepare only the amount that you plan to use as with time the solution tends to change its chemical characteristics allowing insoluble substances to deposit.
It is possible to obtain a coloured varnish adding a colorant to the alcohol during preparation.
The product is applied by brush to bare wood and by applicator pad to more prestigious woods such as walnut, ebony etc.
When using a brush apply evenly in the direction of the grain.
Allow to dry and sand with fine sand paper (240-320).
Repeat the treatment at least twice.
Application with a pad is best left to professionals as the job requires great skill.

Please read: Preparing the applicator pad

Preparing the applicator pad
In the middle of a square piece of linen cloth (20cm by 20cm) put some wool cloth or some flocks of wool. Bring the corners of the linen cloth together and tie with a piece of string in the middle giving the pad a rounded shape.
Apply by dipping the pad in the shellac alcoholic solution and after squeezing to remove excess liquid, spread over the surface using circular movements.
Allow to dry and sand with fine sand paper soaked in paraffin oil.
Repeat the treatment twice after 24 –48 hours diluting the solution 1:2 at every coat.

French polishing Back to Index

Finishing with bees wax or other natural waxes is a widely used technique which gives excellent, easily obtainable results and gives the piece of furniture a warm, soft effect.

Preparation
Warning. Turpentine oil is flammable. The solubilisation must be carried out in a double boiler far from all sources of ignition such as heat, flames, burners and electric motors.

In a steel container add:
50 g. of bees wax
50 g. of carnauba wax broken into small flakes
400 g. of turpentine oil

Dip the container into boiling water and stir until a smooth cream has been obtained.
Allow to cool and pour off
If the consistency is too high dilute further with oil of turpentine
Use a brush to apply the polish which must have been previously heated in a double boiler. Allow to completely dry and repeat the treatment.
Finally, polish with a wool cloth

EXTERIOR FINISHES Back to Index

Great care must be taken when selecting the type of preservative most suited to preserving wood from water, uv radiation, mould and mildew, insects, woodworms etc.
From the ecological point of view water-based preservative which do not contain solvents and which are easy to apply are far preferable to other types.
After the colouring phase add a second coat with a brush and allow to dry.
Repeat the treatment at least twice.

Precautions

It is essential that eye protection and disposable latex gloves be worn during all phases of the operation.
Should alcohol or oil of turpentine be used heat them solely using the double boiler method and eliminating all sources of ignition. Do not smoke.

GLOSSARY

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Alcohol (Ethanol)
A product obtained from fermented sugar or by synthesis. It is used for the solubilisation of shellac and alcohol soluble products. It is available both at 95° and 99°
Warning: ethyl alcohol is a highly flammable solvent. Use far away from all sources of ignition such as heat, flames, burners and electric motors.

Aniline
Can be either a synthetic substance or derived by distillation from fossil coal-tar used for synthesis of the first synthetic dyes.

Water soluble aniline
A term incorrectly employed to denote synthetic organic dyes which are water soluble, even though the product no longer contains aniline. They provide light-fast dyes.

Alcohol soluble aniline
A term incorrectly employed to denote synthetic organic dyes which are soluble in alcohol even though the product no longer contains aniline. They provide dyes which are very bright and which fix rapidly.

Double boiler
A system to render soluble a substance without placing it in direct contact with fire. The substance to be dissolved and the solvent are placed in a container which is then immersed in hot water.

Sand paper
Sand papers are distinguished by a system of numbers rising in units of 20. The greater the number the finer the grit. For finishing, sand papers having a grit of between 180 and 320 should be used.

Dyes
Substances which become soluble in the medium in which they are applied.

Natural dyes
They may be derived either from animals or plants. They are extracted from insects such as the cochineal or from trees, roots or flowers such as logwood, curcumin or saffron. Compared to synthetic dyes they have weaker staining strength and are more fugitive, characteristics which are improved through the use of chemical mordants.

Organic synthetic dyes
Dyes obtained by synthesis from organic compounds. They are characterised by a high level of brightness, high staining strength and good light-fastness.

Oil of turpentine
A solvent obtained through distillation of turpentine obtained from oleoresins of different types of pine. **Beware, this product is highly flammable: to be used far from sources of ignition such as hear, flames, electric burners and motors**

Essences
A term denoting various types of trees.

French polishing
A finishing consisting of bees wax and/or natural waxes melted in oil of turpentine. It is used to restore antique furniture.

Finishing
A term which denotes a stage when the wood is treated which comes after preparation and manufacture of wooden articles. Generally speaking it includes planing, colouring and polishing.

Shellac
Shellac has been used since antiquity; it is a resin extracted from an insect, the Kerria lacca, which lives on the branches of various types of trees in India, Pakistan, Indonesia etc..
It is sold in shiny flakes in colours ranging from light yellow to brown and has orange streaks.

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Preservative
A blend of resins, waxes, solvents, biocides and also often pigments used to protect wood outdoors.

Polishing
An operation consisting of giving a surface area an evenly shiny appearance

Inorganic mordants
Metallic salts used from aqueous solutions to give colour and fix the colour of the wood and natural dyes

Natural mordants
Extracts derived from plants containing humic acid to give colour to the wood and enhance the natural grain

Pigments
Tiny insoluble particles which are dispersed in the medium in which they are applied

Paints
Formulations which form coloured films covering the surface to which they are applied

Applicator pad
A tool utilised to apply alcoholic shellac solutions

Wood filler
A protective treatment which employs resin to close the pores in the wood. It is carried out above all industrially, after colouring, in order to obtain a perfect polished finish

Earth pigments
Natural dyes of mineral origin which are employed in painting

Varnishes
Formulations used to create transparent films