

Surface treatment of tropical wood species with oxidatively drying oils and varnishes

1 GENERAL INFORMATION

Wood consists not only of fibers and lignin. Types of wood differ in their growth and the substances they contain. In particular the substances contained in tropical types of wood can influence the surface treatment in the long term and even lead to certain combinations not being recommended. In addition to bleedings resulting from water-based lacquers, oxidatively drying oils and oilbased lacquers should be regarded especially critically.

2 CHEMICAL BASIS OF OXIDATIVE DRYING

In the base body of vegetable oils glycerin is esterified with three fatty acids. If these fatty acids are unsaturated, i.e. contain reactive double bonds, the groups of fatty acids of various molecules can interlink under the influence of oxygen. Because more than one reactive fatty acid group exists, a polymer resin structure can be built up through forming networks, which due to molecular expansion is no longer fluid and is applied as a solid to the surface, giving it protection.

When alkyd is boiled, this results in a so called transesterification, whereby the fatty acid is transferred to the alkyd base body. As from the outset this can absorb several fatty acid groups, the resulting oilmodified alkyd can build up a polymer network under the influence of oxygen just as well as the underlying oil. The chemical mechanism of oxidative interlinking is identical.

The oxidative reaction is a slow reaction and needs weeks. Therefore it is not acceptable as a coating material for certain applications. In order to accelerate the oxygen interlinking, additives are used in the formulation of coating materials, so called siccative agents. These are dissolved metal salts. They shorten the oxidative interlinking phase so that wood lacquers can typically develop sufficient hardness within one day.

3 INHIBITION OF OXIDATIVE DRYING

Tropical types of wood, depending on the species and sub-species, can contain substances which block the effect of siccative agents. This is referred to as drying inhibition or delay. It is a question of the quantity of critical substances released. If there are enough of these substances, they can completely prevent the accelerating effect of the siccative agents.

Moreover, there are further mechanisms which can inhibit very complicated oxidative interlinking.

4 CONSEQUENCES FOR SURFACE TREATMENT WITH IMPREGNATING OILS

Impregnating oils protect the wood surface by penetrating the wood and solidifying through the oxidative reaction. In this way the impregnation becomes permanent and can no longer be washed out. If the oxidative hardening is impaired, then the result of a watery mopping of the surface is rapid washed-out greying, as well as slight dirt adhesion.

In the case of an oil + waterbased lacquer combination, sufficient hardening of the oil is an imperative prerequisite for good adhesion of the water-based lacquer. If this is slowed by the substances contained in the wood, then longer waiting times have to be reckoned with before applying the water-based lacquer. Because it is virtually

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impossible to calculate the hardening time of oil + waterbased lacquer combinations on critical woods, we simply advise against using them.

5 CONSEQUENCES FOR SURFACE TREATMENT WITH OILBASED LACQUERS

Because of the formulation of such lacquers, they typically contain approx. 50% volatile solvents, if not even more. These solvents evaporate (physical drying) as usual. If the underlying alkyd is a solid, the surface can even acquire a dry grip. However, this may result in a marked delay in the oxidative interlinking. Through building up the polymer networks, the alkydbased binder becomes harder and more durable, loses its solubility and becomes better to sand.

The first consequence of a drying inhibition to be observed is poor sandability, how difficult it is to sand the wood. When applying the second lacquer coat, the solvent from this coat can penetrate the underlying coat, which is not interlinked, causing the first coat to swell. This leads to a characteristic formation of wrinkles.

The development of a matting effect of oxidatively drying lacquers also depends on the hardening process and can result in an uneven matting.

The scratch sensitivity of the coat may also be increased.

Typically such consequences can be prevented by using a blocking primer which is itself not based on oxidative drying.

In cases of minor inhibition it is also possible to apply the alkyd lacquer in a 2-component technique, together with an appropriate isocyanate based hardener. Because it is difficult to calculate the degree of inhibition, however, it is safer to opt for a blocking primer.

In case of doubt we recommend trying out a test patch first.

6 CRITICAL TYPES OF WOOD

This classification is difficult and not conclusive. Sub-species and growing zones can also have an influence on the amount of critical substances contained in the wood.

The common critical types of wood are well known:

teak, padouk, ipe, rosewood, mahogany, massaranduba, merbau, cumaru, ...

The types of tropical wood named above were typically sealed with classic solvent-based polyurethane lacquers, often with a glossy finish. With the introduction of general building inspectorate approval, this kind of lacquer can only be used in Germany with special permission. Which is why the fall back option of oxidatively drying products has been chosen, despite well known difficulties. Water-based lacquer systems are not favored, because they can result in a washed out appearance and reduced development of color intensity.

7 OTHER CONSEQUENCES

Some of these types of wood are used when constructing terraces and there is a general preference for terraces,

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in particular, to be oiled. It has to be assumed that the initial coating can only last for a limited period. As the critical substances contained in the wood are mostly water-soluble, a renovation coat, applied after allowing them to leach out in the meantime, often provides improved protection. In other words: a certain weathering phase before the initial coating has a positive effect.

The contents of this technical information make no claim to be scientifically correct or complete. They merely serve to save professionals from possibly causing damage.

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<p>Headquarter Dr. Schutz GmbH Holbeinstraße 17 D-53175 Bonn Tel.: + 49 228 / 95 35 2-40 Fax: + 49 228 / 95 35 2-46 E-Mail: export@dr-schutz.com www.dr-schutz.com</p>	<p>UK Dr. Schutz U.K Ltd. Unit 24, Anglo Business Park, Smeaton Close, Aylesbury Bucks HP19 8UP Contact: Richard Nelson Tel.: 0044 / 1296 437827 Fax: 0044 / 1296 334219 E-Mail: richard@dr-schutz.com</p>	<p>Ireland Dr. Schutz Ireland 35 Pic Du Jer Park, Ballinlough, Cork Contact: Paul O'Reardon Mobile: 0877678388 E-Mail: drschutzireland@gmail.com</p>	<p>North America Schutz NA 4701 Bath St 46, Philadelphia PA 19137, USA Contact: Sam Jamison Tel.: 001 / 877 272 4889 Mobile: 001 / 215 510 7874 E-Mail: sam@schutzNA.com</p>
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