Porous Paints

(Kapillaråbne malinger)

In the surface-treatment and maintenance of old buildings it is very important for the moister balance in the exterior walls, that you consequently use *capillary open* materials instead of, as most people are used to think, *diffusion open* materials.

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Many owners of older buildings, for instance half-timbered houses, wooden houses with timber-clad facades, or masonry houses, think that it is very expensive and difficult to maintain these. They have to be scraped, sanded and painted, nearly every year, year after year.

But now recent research at the Royal Danish Academy, School of Architecture shows that this is because the maintenance many people carry out on these buildings, is done with the wrong and unsuitable materials, typically plastic paint and cement, and that this, quite frankly, 'ignorance', is a bigger 'threat' against our building culture, than the degradation from rain and moisture, frost and thaw.

Two types of materials for surface treatment of buildings

In the *material shops* for building materials, you can find over hundred materials for surface treatment of buildings. But they are not all equally suitable for the purpose, especially if we look at old buildings, built before 1960.

About 1960, especially at the so-called 'detached houses', which has been built approx. 600.000 of in Denmark from 1960 – 1975, the building industry introduced a lot of new materials and constructions. For instance: Eternite sheets, lime-cement-mortar between the bricks, aerated concrete, sand-lime bricks (synopal), glulam beams, float glass, standard windows in vacuum-impregnated or pressure-impregnated softwood with double-glazed panes, toxic wood preservatives that are now banned, and not the least plastic paint.

Nearly all the previously used building materials, air-lime mortar, wooden boards, windows and dors of special selected heartwood of pine, two-framed windows with double glazing, and surface treatments as linseedoil paint, limewash, glue paints and wood tar.

Now new experiments and practical experience show that these 'old and outdated' materials in reality are far more advanced than the new ones. As something quite unique, they can transport water and moisture out and into the surfaces through small and large pores. There has not before been a word or term for this, but we have called this phenomenon for *capillarity open,* or *pore open,* materials. The opposite of this is the very often described *diffusion open* materials.

Capillary open materials – not diffusion open, on old buildings, please

Moisture transport in a paint layer can happen in two different ways: Through *capillary transport*, i.e. transport of free water through small 'capillary tubes' or pores in the hardened paint film. Or through *diffusion*, which means transport of water vapor through the paint film, molecule by molecule. The capillary transport is considerably faster and transports far more water in the form of free water, per unit of time, than the very slow diffusion that occurs molecule by molecule.

What the research has found is that 'diffusion openness' is a catastrophically bad property for a surface treatment on especially older buildings when these have to be maintained today. Buildings that were built before approx. 1960 consists of materials from the outside to the inside that are, or with age and time have become, porous. Therefore, instead of a 'diffusion-open' surface treatment, one must use one that is itself porous. We have another word for this property, the capillary suction.

This is where the 'hop' lies in all maintenance of exterior wood and masonry. With plastic paint, you create bigger and bigger problems, year after year, and we very often see that the wood starts to rot, underneath the plastic paint, after just a few years, because the wood here is constantly moisturised. Even quarter sawn - and core-cut 100% heartwood in old windows can't even manage that.

If you resolutely clean off the plastic paint and instead uses the capillary-opened materials, you have to maintain at much longer intervals, the maintenance does not make the condition of the wood or masonry more worse and the maintenance also requires far less work – and money – because you have to scrape and sand the surfaces far less, as the paint practically does not peel off if the application is carried out correctly.

The most important concept we need to understand when painting exterior wood is the difference between 'capillary open' materials and 'diffusion open' materials for the maintenance and refurbishment of older buildings.

Diffusion open materials

A *diffusion open paint or surface treatment* allows water molecules to move through the paint film, molecule by molecule. This means that the 'diffusion openness' (z-value) of the paint, e.g. a plastic paint, is largely dependent on the thickness of the layer of the paint - including how many layers of 'diffusion open paint' there are applied on the surface. In order to maintain the same z-value for a 'diffusion-open' surface treatment, one must therefore, at all maintenances and retreatments, *remove at least one previous layer*.

Otherwise, the vapor diffusion density increases with each new layer. Common to most types of plastic and acrylic paints is that their binder is based on finely divided, microscopic plastic particles in water, as a so-called dispersion. A report from the Danish Environmental Protection Agency established in 2015 that plastic paint is one of the main sources of *microplastics* in the sea and nature, so this is yet another reason to avoid plastic paint today (Miljøstyrelsen, 2015).

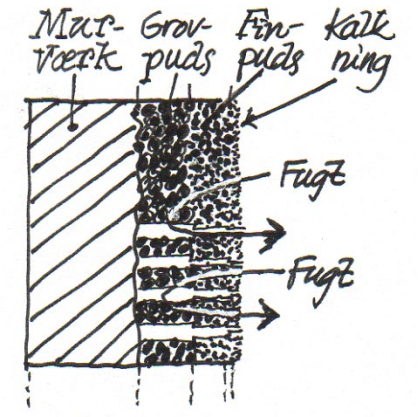
Plastic painted half-timbered facade.
This type of paint is a disaster for old, porous, buildings, especially half-timbered buildings like this one.
You can be lucky, as here, that the paint itself peels off, so that the brickwork and wood are not constantly damp, but many people just apply a new layer of plastic paint on the outside of the old one, and then unfortunately it's all over.
The maintenance here must consist of removing all the plastic paint and after that painting with capillary open paint types. This also means far less work in the future.

This half-timbered facade from the 1750s is whitewashed approximately every 10 years. At the same time, the timber is painted with white casein paint and the foot strap is painted with black wood tar colour. The windows are painted with linseedoil paint approximately every time. 20 years. All capillary-open materials – and absolutely ***not*** *diffusion-open materials.*

Capillary open materials

A capillary open paint allows capillary transport of free water through its pores, i.e. more or less microscopic 'tubes' in the material. This means that moisture e.g. cannot accumulate in a material painted with a capillary open paint. Glue paints, tempera paints, wood tar and linseedoil paint - as well as whitewash and lime paints are e.g. capillary-open materials, while plastic film and plastic paint are not. Since wood, timber, plaster and brick are already porous and capillary-open materials, you can say to yourself that it is a completely wrong strategy to close the porosity of the exterior and interior with a diffusion-open material, when the capillary-open paints now do this much better and with a much longer shelf life.

The capillary-open surface treatments such as glue paints, tempera paints and to some extent linseedoil paint are also very useful inside the buildings, as they, in connection with porous/open-pore building materials such as wood, lime plaster or brick, will help to regulate the indoor climate and especially the humidity conditions in the rooms. Since it costs much more energy to heat moist air than dry air, the open capillary materials can also help to save on energy consumption in the house. They also ensure that mold or mildew does not form on any cold outer wall or other surfaces, because the moisture does not condense into water droplets, but is sucked into the bottom.



The most obvious example of the effect of capillary open materials is plaster on masonry, where the air-curing lime mortar that was used before the 1960s forms small air pores in the material itself during carbonation.

Since free water always goes from coarse pores to fine pores in porous materials, which is a physical law in the same way as the law of gravity is in air, the masons have from ancient times used to throw a coarse mortar onto the wall first, with coarse grains of sand, which form coarse pores - and then apply a mortar with a finer grain size, which form more fine pores in the surface. This construction of the facade plaster creates a 'moisture direction' from the inside out, regulated by a physical law.

If this advanced plaster construction is finished with a capillary open limewash, which itself consists of even smaller pores, the capillary and drying effect in the masonry becomes even more evident. On the other hand, if the surface is painted with a diffusion-open plastic paint or similar, which has no pores in the structure, the capillary effect in the masonry will be minimized or destroyed, and the masonry will be moistened.

The same happens if you plaster the brickwork, or even worse plinth brickwork, with cement plaster or lime-cement plaster. Materials, which are very strong and hard, but do not form pores at all. Then the walls will become more and more damp and thus both deteriorate faster and also create a damp and unhealthy indoor climate.

These technical, sustainability and knowledge-related problems with the maintenance of older buildings have arisen in the Danish construction industry over the last 40-50 years. We can see that today, after exactly these 40-50 years of accidents and destruction of our building culture - especially of the relatively fragile half-timbered buildings from the 1600s, 1800s and 1900s.

Paint on exterior wood with porous paints

Today we have four types of dense (film-forming) paints on the market for exterior wood:

1: Linseedoil paint
Consisting of boiled linseedoil (linseedoil from nature) torn mineral pigments.
The linseedoil paint hardens by absorbing oxygen from the air, which turns the linseedoil into a solid substance. Because it takes a little time, the fine molecular linseedoil penetrates well into the wood, which is thereby both strengthened and more water-repellent. During the oxygenation, the linseedoil expands approx. 18% in its volume, which gives the linseedoil paint an unsurpassed adhesion on e.g. wood or masonry. Linseedoil paint was called before approx. 1990 simply 'oil paint', but due to a widespread confusion of this with its 'replacer' in the 1950s, the alkyd oil paint/alkyd paint/synthetic oil paint to be added to turpentine, and therefore banned from the painting profession in 1976, it is necessary to use the name 'linoleic paint'. This must not and must not be added to turpentine or other volatile solvents.

2: Alkyd paint, alkyd oil paint, 'oil paint'
Consisting of oil, probably boiled linseedoil, with added 'artificial resin', made from crude oil and called 'alkyd' - because of its manufacture during a chemical process, invented in the 1920s, between alcohol and an acid (fatty acid). In English it became the abbreviation 'alcid' as 'al' from alcohol and 'cid' from the ending of 'acid' are combined. In Danish, 'alkyd'. In the past, real resin from pine trees was added to the linseedoil paint to make it glossy, the so-called varnishes or lacquer colours, but with the invention of the artificial resin, alkyd, the replacement had been found. And the alkyd paint almost completely took over the market from the linseedoil paint, from which it even took the name 'oil paint'. But since alkyd is a solid, it was necessary to mix a solvent into the paint, in the form of mineral or 'French' turpentine. In 1976, alkyd paint was therefore banned in Denmark for painters for reasons of working environment, but it can still be bought and used by 'private' consumers. However, over the years it has proven to be both too dense, too hard and too inflexible for use on exterior wood, so the alkyd paint cannot in any way be recommended for exterior wood today. Instead, you have to go 'back' to the linseedoil paint, which is now produced again and which has much better properties on exterior wood.

3: Plastic paint or plastic paint, which is also called acrylic paint
Consisting of a dispersion of microscopic plastic particles, made from crude oil, in water and pigments. When the water in the paint evaporates, the plastic particles stick together to form an almost insoluble paint film as a plastic layer on top of the treated material, but without penetrating it. So-called fungicides are added to plastic paint for outdoor use, which must prevent the formation of mould and mildew on the surface. Since the plastic paint contains approx. 60% water, part of this goes into the wood structure of the tree and moistens it. Next, the plastic paint shrinks in volume when the water evaporates, whereby the adhesion deteriorates. So plastic or acrylic paint cannot be recommended for exterior wood for that reason alone.

4: 'Water-based oil paint'
Consisting of various paint products that contain both water and oil. This can be done by emulsifying oil in a 'watery/water-based' plastic or acrylic paint, with added emulsifiers. Here, the oil lies as microscopic droplets in the paint, and since this is an emulsified oil and not a free oil, there is no penetration of the oil into the base that is being painted on, e.g. wood. These types of paint go by names such as 'oil emulsion paint', water based alkyd, plastic alkyd, acrylic alkyd paint, etc. In terms of the properties, both regarding adhesion and the moisture dynamics, which this article is about, the 'water-based oil paint' behaves quite like the plastic and acrylic paint.

Other paint types for exterior wood

As we shall see on the next pages, there were in the past three additional types of paints on exterior wood, namely various glue paints and tempera paints as well as wood tar and wood tar colour. Wood tar and wood tar colour are available for sale.

All three have some extremely interesting properties in relation to porosity, moisture dynamics and the minimal burden of the ingredients on the limited resources of the earth. Including crude oil. These cannot be bought commercially today, but they can be made on site either by painters or by yourself.

We will here exclude the so-called 'wood protection' products, consisting of the thin, semi- or fully transparent turpentine stains or 'watery' modifications, added small (previously large) amounts of 'fungicides'. The non-film-forming products for the surface treatment of wood work poorly on this, as they do not shield the wood from the sun's UV rays, they do not add new oils to the wood, and for both reasons they cause the wood to ooze, crack, split and warp.

Close-up of plastic painted wood.

The method to remove the plastic paint is a 'partial wet scraping and wet sanding - without heat'. This is on the one hand much faster and cheaper than a 'total' cleaning, because you only remove the absolutely loose paint, on the other hand you can leave approx. 20-25% of the plastic paint sits inside cracks and small gaps.

The worst thing you can do, both for the wood and for the environment, is to use heat. (fan heater, speed heater etc.). Because then the old wood is destroyed and tortured for its vital oil and resin substances.

With a partial wet scraping and wet sanding as described - without heat, you add a lot of linseedoil to the wood, which on the contrary saturates the old wood with lots of vital oil substances. The new paint is of course done with linseedoil paint, which, as you know, contains a good water-repellent oil.

The difference between linseedoil paint and plastic paints

For many years it has been 'good Latin' that a covering paint on external wood should primarily prevent water and moisture from penetrating the wood. But now it turns out i.a. through Swedish studies, from as far back as 1995[1], that there is quite a big difference between the properties of the different types of paint in relation to transporting moisture and water through the paint film, the so-called 'moisture dynamic properties'.

Here it turns out that alkyd paint and linseedoil paint have equal moisture penetration (moisture penetration resistance) for both water vapor and free water. The water and moisture penetrate both in vapor form and as free water just as quickly through the paint film as out. As early as 1976, alkyd paint containing turpentine was banned in the painting profession for occupational health reasons, so we can today disregard the properties of this paint.

For acrylic paints, however, it applies that this has a greater moisture penetration resistance for water vapor than for free water. This means that free water has a greater opportunity to pass through the paint film than water vapour. This is because plastic and acrylic paints have added substances, the so-called 'surfactants', which are supposed to make the plastic substances 'flow together' and stabilize the paint. However, these 'flux substances' are 'hydrophilic', i.e. 'water-loving', so tests have shown that these, even in the dried-up paint, and especially when wet, open a lot of small pores in the paint film itself, which let free water in by capillary action.

When the paint film subsequently dries, the water must escape again by diffusion, which is much slower. Therefore, during periods of alternating rain and sunshine, the wood is critically moistened under an exterior plastic paint. This unfortunate effect is reinforced by thicker and thicker layers of plastic and acrylic paint, including through 'misunderstood' maintenance, where additional layers of paint are applied if the old one has cracked and peeled off. Every time you paint a new layer of plastic and acrylic paint on an existing base, you must consistently remove at least one layer.

In the case of capillary open paint types such as linseedoil paint etc. more and more layers on top of each other mean nothing to their capillary openness. The capillary-open paint types are therefore the most appropriate on exterior wood, whereas the diffusion-open types should be avoided.

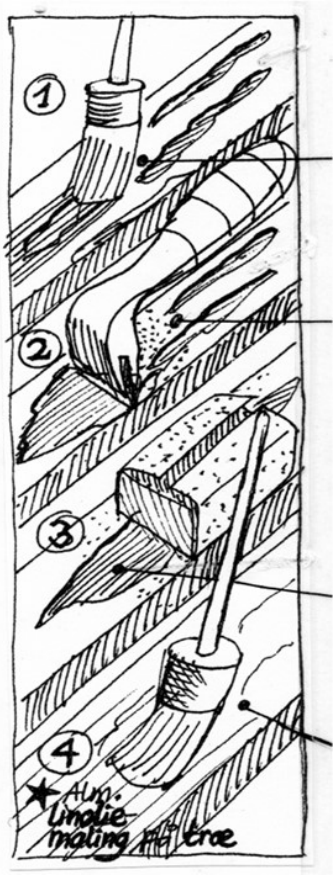
Cleaning of plastic paint on wood

If there is plastic paint (or alkyd paint) on our old wooden or half-timbered house, this must be removed as soon as possible, both on an external board covering, on timber and boards. Here we stick to the wood itself: Fortunately, plastic paint becomes very 'soft' and releases the base easily when wet, because of the later described 'hydrophilic', i.e. 'water-loving' substances, so we carry out a 'wet, cold scraping' with ordinary 'hard metal scrapers', and absolutely without heat. If you use heat (air, flame or infrared) all the old paint will 'burn' off and 'release' the base. During the subsequent cleaning, even the smallest 'spot' of old paint will constitute a weak point and fall off.

To get the surface wet you could use water, but on exterior wood a good layer of boiled linseedoil on both the loose and the stuck-on plastic paint, is better. This makes the plastic paint on the wood much 'softer' and easier to scrape off. Gradually add more linseedoil and scrape again. All scraped paint residues must be collected and sent for chemical disposal. You must scrape off at least 75%, but you can leave approx. 25% fixed plastic paint sit inside the surface's cracks and crevices.

[1] Ekstedt, Jan (1995): *Triangeldrama mellan fukt, färg och trä*. Trä-information (nr. 2/95). Sverige

Procedure for partial wet scraping and wet sanding - without heat



The peeled paint is applied with a good layer of linoleum varnish (boiled linseedoil) with a brush. The oil must sit on the wood/paint layer for fifteen minutes before the further process

Now the areas with peeling paint are scraped at the bottom by hand with a carbide scraper. Do not use heat or machine sanding for this. Only the loose paint is scraped off. The adhering paint is left alone. All paint flakes and excess linseedoil are wiped off. NB: Wet linseedoil rags must either be burned, drowned or spread out after work, as these can otherwise ignite spontaneously.

As edges and burrs will now appear in the paint layer, these are sanded smooth and neat by hand with sandpaper/emery cloth, after additional linoleum varnish has been applied to prevent/reduce sanding dust from the sanding. All excess linseedoil and wet sanding dust are wiped off.

Finally, the wood is painted with 2 thin layers of linseedoil paint

NB: Wet linseedoil cloths can spontaneously ignite. They must be deposited in a metal bucket with a lid. Never in a garbage bag.

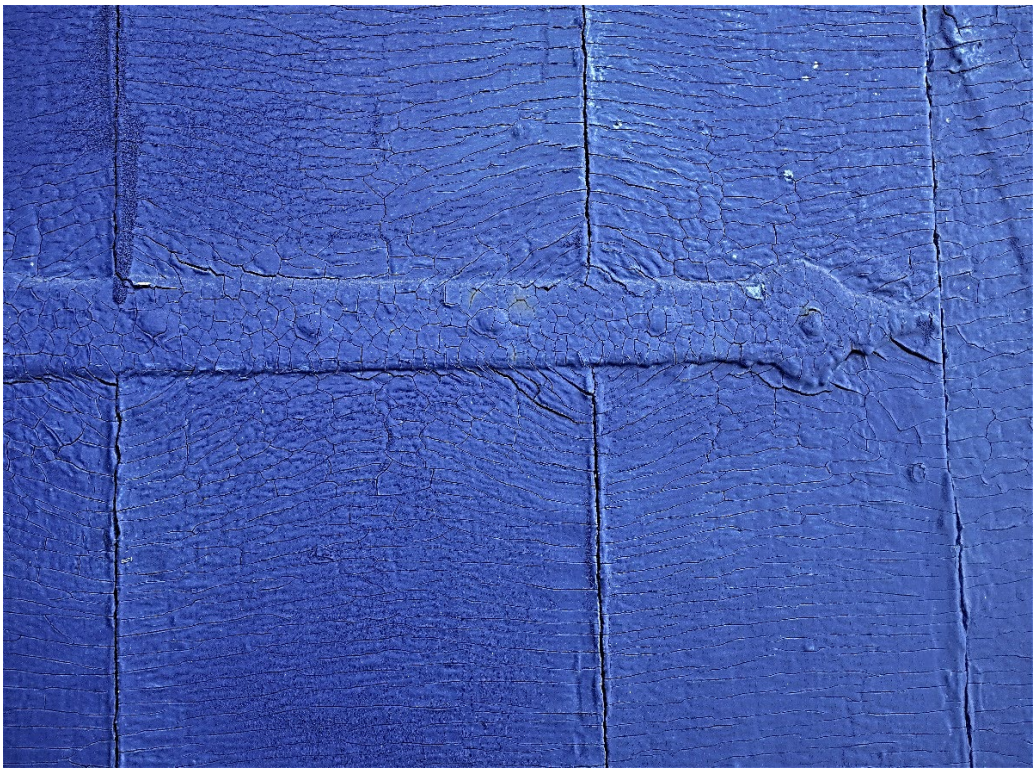
Regeneration of rot attack in the woodwork with warm wood tar color.
As soon as most of the plastic paint has been removed, you should not be afraid that the rot attacks that have spread under the paint will spread further. This only happens in the moist environment created by the dense plastic paint. A material such as wood tar, not to be confused with the jet-black coal tar', which is both toxic, carcinogenic and prohibited, is then able to 're-harden' and repair any soft and worn areas in the wood. Wood tar consists of a concentrate of the pine tree's own oil and resinous substances, which are brought back to the tree in this way. Pigmented wood tar, so-called wood tar color, e.g. with oxide black pigment, is very suitable here. The treatment with wood tar and wood tar color will take a month or a half in light and air before the wood tar has hardened. Wood tar should not be used internally, but it can be replaced here with boiled linseedoil, which is also non-toxic.

Closing all cracks with 'tar putty'
While the wood tar is 'wet', all large and small cracks and fissures in the boards and the timber, also in all the wooden joints of the timber frame, are closed with tar putty, a thick and firm 'putty' of wood tar and chalk, mixed while the wood tar is heated. The tar putty will stick well to the surfaces and here work well with the wood and also be good at keeping water out. When the wood tar and tar putty have hardened, which will take a month, you can paint on this without any problems, both with linoleum paint and with casein paint.

Specific execution

Linseedoil paint

Linseedoil paint is made from boiled linseedoil grinded into finely ground pigments. The linseedoil hardens into a solid by a chemical process where it absorbs oxygen from the air. Thereby, the oil expands approx. 18%, whereby the paint 'bites' firmly on the bottom. Turpentine or other volatile solvents must not be mixed into the linseedoil paint, as this effect is destroyed.



On this at least 150-year-old linseedoil paint surface, the cracked and pore-open Structure, called 'snake skin cracking' is very clearly visible

Linseedoil paint is generally both environmentally friendly and work environment friendly, although depending on the chemistry of the pigments. Linseedoil paint was previously just called 'oil paint', but since the 1950s this name changed to the alkyd paint that contains turpentine and is problematic for the working environment, which was banned for the painting profession in 1976. So, to avoid a very unfortunate confusion, it is important that you use the name *linseedoil paint* and not 'oil paint' for this completely non-toxic 'oil paints' that contain only boiled linseedoil and pigment.

As mentioned, linseedoil paint has an unsurpassed adhesion to wood, it contains linseedoil, which benefits the durability of the wood and after some time, depending on the pigments, the linseedoil paint cracks on the surface and thereby becomes capillary open. Linseedoil paint must only be maintained with the application of boiled linseedoil after the first 10-15 years. The paint should 'never' be completely cleaned, but can be scraped wet and then repainted after approx. 15-20 years.

Glue paints

Red-painted half-timbering, painted with casein paint, mixed from casein (non-homogenised buttermilk), baking powder and red ocher pigment.

In the glue colour, the pigments lie completely on the surface and reflect the light - in the same way as a white lime wash. The durability is 5-8 years until the next re-treatment, which corresponds to the whitewash or lime colours on the plastered boards.

The foot strap should be treated with wood tar colour that keeps rain and moisture out of the wood.

Glue paint for outdoor surface treatment on rough wood is made from casein glue (casein paint) or boiled rye flour (Swedish mud paint).

Casein paint

Casein paint is made from dry casein in warm water (or heated, non-homogenized buttermilk or skimmed milk) mixed with *ammonium hydrogen carbonate* (baking powder) (1 litre to 25 grams). After adding the ammonium hydrogen carbonate, the mixture fizzes up and takes on a strong smell of ammonia. After a short period of time, the pigments are mixed in as a thick 'paste' stirred in plain water. A test coat is carried out, which must dry completely and which is then checked for coverage,

non-smudge and colour. Therefore, you must always 'save' a bit of both the binder and the pigment paste, in order to fine-tune the glue colour.

In a dried-up glue colour, the small sharp-edged pigment grains lie all the way out on the surface of the colour and here reflects the light in a very beautiful way - much like the pigments did before they were mixed into the paint. Casein paint will therefore, painted on underlined timberwork, look incredibly beautiful and 'bright' - in the same way as whitewashed blackboards.

Wood tar colours

In a heated state, wood tar can be pigmented with black, red, green, even yellow pigments, after which this is applied to e.g. half-timbered timber, but also on other timber. Contrary to the glue colour, the texture of the wood tar colour is very far from the beautiful light refraction of the pigments, but the colour is, on the other hand, very robust in relation to moisture, and coloured with oxide black, therefore particularly suitable for the foot strap.

The wood tar colour, here with black pigment, makes after some time very characteristic patterns, called 'elephant skin'

Tempera colours

Tempera paint, composition paint or emulsion paint consists of a linseedoil paint that has been emulsified (microscopically finely divided) by mixing an aqueous glue (casein glue, milk glue, skin or bone glue) into the colour. Thereby, the paint will partly transition into the water phase and become water-dilatable, and partly it will dry/harden very quickly, compared to the linseedoil colour's hardening. In this way, tempera paint is more capillary open and dries/hardens faster than linseedoil paint.

The mixing ratio is 1 part linseedoil varnish to 2 parts aqueous glue. The easiest thing here is to use casein glue, made from 1 liter of heated, non-homogenized buttermilk or skimmed milk, mixed with 25 grams of venison salt.

Tempera is pronounced with stress on the first syllable. The word is Latin and means 'mixed in the right proportion'.

Lime soap treatment on wood

Lime soap treatment is used for 'lye treatment' of new or existing wooden floors and after having treated several floors with this method, the results are extremely beautiful and durable.

After a visit from some Japanese researchers from Kyoto in March 2019, who included working with the surface treatment of the famous Shinta temples in Kyoto, which are burned down and rebuilt every 20 years, we learned about a Japanese 'lime soap treatment of wood, called 'ARAI', which is used outdoors and here also can keep algae growth down. See: https://www.bevardithus.dk/saebeskuring-af-trae/.

In the summer of 2020 we held a 'Summer School' at the Royal Danish Academy for 22 architecture students and 4 teachers, we designed and build a wooden 'fishing hut' by Gram å in South Jutland. It was made with timber and wood from the company Dinesen - see: https://www.bevardithus.dk/kadk-sommerskole- 2020-hos-dinesen-i-jels/ Here we wanted to experiment with painting and colouring this building with 'lime soap colour' with oxide black pigment, which turns it grey. Nobody has tried this surface treatment before. Time will tell how this works and lasts.

Exterior lime soap colour on wood

Recipe
3 litres of boiling water
1 bag of soap shavings (in Southern Jutland called 'Knofedt' on the bag)
1 litre slaked lime / air lime (wet slaked quicklime dough)
1 kg oxide black pigment

When mixing begins and during actual work, rubber gloves and safety glasses must be worn.

Mixture of lime-soap mixture
Soap shavings and warm water are whipped well so that all the 'soap shavings' are dissolved and the mass takes on a mushy substance.
The slaked lime is mixed into this. The mixture is whipped if necessary. with a mixer to mix well.
More water can be added until the consistency is like thick milk

Pigment paste
Mix the pigment with pain water, not too much, as a thick ‘paste’ and stir or mix it carefully until the air bobbles from the mass stops.

Lime soap colour
Mix the pigment past into the lime soap liquid. Start with a less amount and make a test on a piece of wood, which should dry out, as the finished, dried colour is very different from the wet paint. Because of the massive white colour of the lime wash, the colour can not be black, for instance, but only dark, cold grey.

Mix if necessary more pigment paste in the colour, until a dried-out sample has the desired colour. Paint the façade from above to the bottom with broad brushes.

It is characteristic for this wood treatment with soap colour, that water droplets from rainwater bead off the surface – without penetrating the wood.

The Gram-å-hut during the painting in 2020 – and photographed again in 2022.

Treatment of external terrace surfaces of wood with lime-soap treatment without pigments

Before treating the terrace, it must be swept and vacuumed well for all dirt etc. Next, wash and wet the surface with plain water with a well-wet floor cloth. If/when the water becomes 'grey', it must be changed to clean water. You must not 'wet' the wood with dirty, grey water.

Immediately afterwards, the lime soap mixture is applied with a lime brush or similar, which is partly rubbed down/into the surface, and partly leaves a thin layer on top of the boards or tile surface.

This mixture should now harden completely white all over the surface. Purely chemically, the slaked lime hardens into chalk with the help of carbon dioxide in the air.

Now you mix a bucket of soapy water with soap shavings in warm water - like a good 'fat' mixture (feel with your fingers). With a floor cloth, you wash off the white layer on the surface - which may well require some effort. You should change the soapy water 1-2 times along the way when it becomes too saturated with chalk/lime. You now let the surface dry completely, and then wash it once more with soap shavings in warm water. Then the treatment is finished.

Wooden boards on a garden table, treated with lime soap treatment. Notice how water droplets bead off the surface - for some time before they soak in.

Further reading (in Danish)

Vadstrup, Søren (2021c): *Vedligeholdelse af udvendigt træ – med klassiske materialer og metoder*
https://www.bevardithus.dk/vedligeholdelse-af-udvendigt-trae-med-klassiske-materialer-og-metoder/

Vadstrup, Søren (2021b): *Huse i farver*. Forlaget Book-Lab 2021 (side 293)

Vadstrup, Søren (2021a): *LANDHUSET – historie, bevaring, istandsættelse*.
Lindhardt & Ringhof Forlag, København. 2021 (side 333-341).

Vadstrup, Søren (2020): *Udvendig kalksæbe-behandling og kalksæbe-farver*
https://www.bevardithus.dk/udvendig-kalksaebe-behandling-og-kalksaebe-farver/

Miljøstyrelsen. (2015). *Microplastics. Occurrence, effects and sources of Releases to the environment in Denmark*. Environmental project No. 1793, 2015.
https://www.tilogaard.dk/Miljostyrelsens_rapport_om_mikroplast_978-87-93352-80-3.pdf

Vadstrup, Søren (2014): *BYHUSET - Historie, bevaring, istandsættelse*.
Lindhardt og Ringhof Forlag, København 2014 (side 354)

Vadstrup, Søren (2014): *MALEMATERIALER II – Heldækkende malingstyper til ældre bygninger*.
Kulturministeriet. Kulturstyrelsen: Information om Bygningsbevaring 2014. (side 11-13).
https://slks.dk/fileadmin/user_upload/SLKS/Omraader/Kulturarv/Bygningsfredning/Gode_raad_om_vedligeholdelse/8.4_Malematerialer_II__heldaekkende_malingstyper_til_ael.pdf

Vadstrup, Søren (2004): *Huse med sjæl. Om nænsom istandsættelse og bevaringsmæssig forbedring af ældre bygninger*. Gyldendal 2004 (side 319)

Vadstrup, Søren (2000): *Træbeklædning. Historie og vedligeholdelse*.
Landsforeningen By og Land, 2000 (side 43)

Ekstedt, Jan (1995): *Triangeldrama mellan fukt, färg och trä*.
Trä-information (nr. 2/95). Sverige. (side 13-14)