

Wiebke Pandikow

an exchange student's
research on

URUSHI



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Foreword

When I went on exchange to Toyama University, the campus of Takaoka, Japan in the spring of 2011, urushi wasn't my main reason for going. I had heard of it, seen some traditional works and was interested in it, but there were many other things at least equally important.

Eventually though, after ten months, urushi had become the one thing that had cost me the most time, energy, nerves and possibly tears. It had also brought me immense satisfaction, joy and some very intense moments in my time spent there on the other side of the world.

I am obviously not anywhere near a real urushi crafts(wo-)man. I am hardly even an apprentice. All of my Japanese classmates there probably know more about it than I ever will. But I was then and still am extremely fascinated by this material and the techniques connected to it. What I wish to do with this small research is simply to share some of the knowledge that I have gained. And for that knowledge my greatest thanks goes to my teachers - Taro Ogawa, Satoru Hayashi and Siichi Takahashi - as well as to all my classmates from that time, especially to the students of the

master classes from 2011, who helped me constantly.

I can give only a tiny fraction of information compared to the huge amount the Japanese have accumulated in their history of working with urushi, but I hope it will be interesting nonetheless and give at least some kind of idea to "western" people who want to know a little more practical things about urushi and the basic techniques connected to it.

At least for me the greatest joy in urushi comes from doing it myself, despite the physical problems it might cause particularly at the start.

I hope I might help someone else feel that joy themselves when they take their very first steps into the world of Japanese lacquerware.

Wiebke Pandikow
Finland, December 2012



1 Introduction

This work is meant as a very basic introduction to what it means to work with Japanese lacquer. It is not a scientific research and it is definitely no school book. But it should be able to give a newcomer to the technique some basic ideas of how it works, and for someone who has sometimes worked with *urushi*, it might even function as a basic guide. If you have not worked with *urushi* before, then also after reading this, you will probably have great difficulty doing it on your own. Like many crafts, using Japanese lacquer is something that has to be learned over time and through repetition and preferably under the guidance of a teacher or craftsman who has a lot of experience with it. What I have written about in this research are things that have worked for me, but *urushi* can be fickle and is easily dependant for example on the weather - especially temperature and humidity. Also, there are many different ways to create an *urushi* surface. The materials I used and the steps I followed to create my presentational boards are according to the Kanazawa way of doing it. In other parts of Japan craftsmen might use slightly different materials and a slightly different way to build up the surface. Generally, *urushi* is learning by doing, and learning by making mistakes.

As for some basics, *urushi* (漆 in Japanese) is the sap of the varnish tree *rhus verniciflua* (Prendergast, Jaeschke, Rumball 2001, 13).

The oldest lacquered object found until today has been dated at 9000 years old, and it is inferred that *urushi* has been used in Japan already in the Jomon period, about 10.000 years ago. It has been applied to a wide range of objects, from ritual utensils, food items and furniture up to weapons and armour. (Nishide M. 2011.)

It is very resistant to chemical and mechanical influences once it has set into a hard surface, which makes it suitable for all kinds of applications and can be applied to a wide range of materials. Wood and fabric are probably still the most common, but among others also ceramics, leather, certain kinds of plastic or for example ebonite – a hard rubber used to make fountain pens – can be used as a base for *urushi* work (Anderson B. 2011).

Urushi is a very strong glue, a fact which is being utilized widely for many different techniques, as for example different kinds of inlay with precious metals and mother-of-pearl.

Apart from its positive properties though, especially for beginners there is some risk involved in working with *urushi*. The varnish tree and therefore its sap as well, contains a chemical called urushiol, which in the presence of oxygen causes dermatitis. The severity depends on the kind of *urushi*, but also very much on the person. Generally though, everybody whose skin comes into contact with the lacquer

for the first time will get some kind of allergic reaction, but only if the lacquer is in its liquid form. As soon as it has hardened, allergic reactions to it are highly unlikely. (Prendergast, Jaeschke, Rumball 2001, 13-15.)

But this means that it is better to take heed when starting to work with *urushi*. Protect your arms and hands for example by wearing rubber gloves and a long sleeved shirt; an old long-sleeved shirt, since the lacquer will stick nicely to your fabrics.

Apart from the basic informations about which materials and tools to use and how exactly the surface is created, there are other things that need to be considered. How to keep one's tools in shape for example, how to cut an original Japanese brush before it can be used, how to sharpen the knife or the blade of the plane. But since I write this with a western audience in mind who might substitute those tools with other equivalents, I have for now refrained from describing how they are prepared before useage. For a potential later version of this text, I might add more information about those things. For now, it is mostly about the very basic What and How.

And lastly a few words about my usage of Japanese language. Whenever I use Japanese terms - written in italics - I attempted to transcribe them by the revised Hepburn system. Still, I am no Japanese teacher and even the Japanese themselves are usually not quite sure how to transcribe certain sounds into Romanji, our Latin letters, so I do not vouch for the accuracy of my transcriptions.

This should be all for the preliminary information. Now it's the dive into the research itself.

Tools and Materials

Basic Tools

A *jouban* is a work board. All *urushi* is mixed on it, so its surface should be even and durable. If dried *urushi* accumulates on it, making the board uneven, it should be sanded down with basic sandpaper. The boards used in Takaoka are wooden and about 45 to 40 centimetres, with rounded corners and a hard, white top of melamine. If only a basic wooden board is used, it should first be coated with a mixture of 7 parts *ki-urushi* to 3 parts paraffin oil to seal the wood from soaking up any lacquer that will later be prepared on it.



Hera are spatulas used to mix *urushi* and also to apply it to a surface. They are commonly made from wood or plastic, available in different sizes and hardnesses. Wooden ones have the advantage that they can be easily custom shaped and their flexibility adjusted. Plastic spatulas are convenient for taking rests of lacquer out of a bowl or for works where great pressure is exerted on the spatula. They bend well and don't break as easily as the common *hinokibera* (made of Japanese Cypress wood). The very hard *takebera*, spatula made from bamboo, are useful for preparing very tough mixtures like for example *kokuso* (see page 21).



In the past more common but nowadays only seldomly used are *kujirabera*, spatulas made from whale's baleen. A traditionally shaped *hera* is the best to use, but of course basically, any kind of spatula in the right size could be used. For example spatulas from art supply stores or even the ones used to take off wallpaper. Wooden kitchen spatulas though are usually not flexible enough and often are slightly bent, which makes them not a good choice.

Hake are flat brushes in different sizes and lengths, usually made of human hair and used to apply *urushi* to any kind of surface. Because the hair usually runs part-way or even completely through the whole brush, it can be cut and reshaped when its tip wears out.

A newly bought *hake* needs to be prepared before it can be used, since the hair is hardened by the *urushi* with which it is glued into the wood of the shaft and protected by protruding pieces of wood at the tip.

Understandably, outside of Asia it will be difficult to obtain a brush like that. Of course theoretically any other brush can be used, but it should be very close in shape to the original *hake*, with tightly packed bristles and a tip as straight and even as possible, to ensure an even application of the lacquer.





A *furo* is usually a wooden cabinet with slide doors in which the humidity can be controlled to set *urushi*. Basically there are two different kinds: In the *Shimeshiburo* the humidity is high (70% to 80%) and the temperature somewhere between 24°C and 30°C, with the optimum being 25°C. This is the usual choice for setting a layer of lacquer quite fast.

The other one is *karaburo* ('empty *furo*'). In contrast to the *Shimeshiburo* this is kept at a lower humidity to set *urushi* slowly, the exact percentage depending on the kind of work done. Some techniques or some kinds of lacquer require being set slowly. Also, if *urushi* is applied very thickly, it might be safer to set it in the *karaburo*, to avoid shrinking and warping caused by the surface of the lacquer setting faster than the lacquer beneath.

In the highly humid Japanese summer, the *karaburo* needs to be actively dried, in Finnish conditions that should not be necessary.

In the end, any kind of container in which humidity and temperature can be somehow regulated can be used to set *urushi*. I am using a plastic box but have also heard about Working with *urushi* in Finland I have been using a plastic box, but I have also heard of the usage of old tea crates or even cardboard boxes, the humidity regulated by moistened towels or dishes with water.



Hamono – Blades

The *kiridashi* or *kogatana* is a small all-round knife used whenever anything needs to be cut.

Nushiyagatana or *nushiyabouchou* is a bigger blade with wooden handle and sheath. So far I have only used it in making *hera*, where it could be substituted with a small axe. Japanese craftsmen consider it very important, but in countries without the same cultural background, I don't think it an absolutely necessary tool.

Kanna is a hand plane. It is needed in preparing a *hera* and generally to make any wooden surface plane.



Sandpaper in different grits is used for sanding for example the base or some of the groundwork layers of an *urushi* object.

Water sharpening stones should be available at least in medium (around 800 to 1000) and fine grit (1200 and upwards). The medium grit is used for sharpening the blades of knives and planes, but also for sanding some groundwork layers of an *urushi* surface, or for flattening smaller sharpening stones and charcoal against it. The fine grit stone is used for honing the blades of knives and planes after they are sharpened with the medium stone as well as for sanding certain layers of an *urushi* surface.

One of the most common labels of sharpening stones in Japan is King. These waterstones have a relatively soft surface which tends to develop hollows while they are used, which is why they need to be re-flattened once in a while, especially when sharpening blades. This can be done either with a flattening stone or with another waterstone of the same grit.

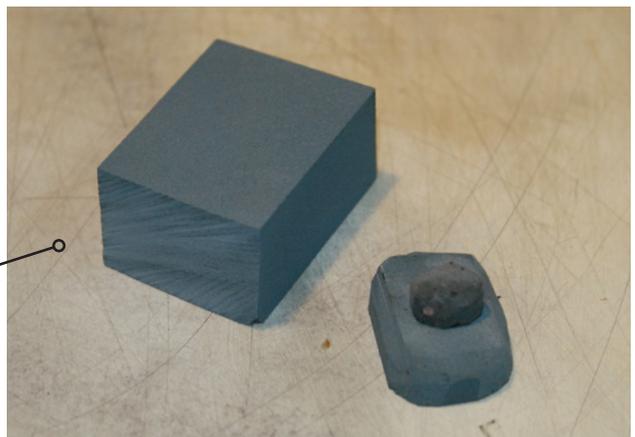
Generally these stones could be used with oil as well, for sharpening the blades for example. But since when sanding *urushi* they need to be used with water, which would be impossible after they have once been used with oil, they should be kept exclusively as water stones.

Another kind of synthetic sharpening stone is made of green silicon carbide, and these are in Japan usually referred to as 'Green Carbon' stones. Of them, a grit 400 is used dry, the finer grit 700-800 together with water to sand groundwork layers.

Getting basic Japanese waterstones should not be a problem in Europe, obtaining the same Green Carbon as I used there seems to be more difficult. So far I have found those exact materials only from Japanese language home pages. Generally though, I have been told that a normal sharpening stone in the according grit can be used as well, though supposedly the sanding itself will take longer than it would with Green Carbon. A stone called Bester from the firm Imanishi might be a good substitute, since they sharpen faster than for example King stones.

Apart from these basic sharpening stones, one other, finer honing stone is needed, this one called Crystal (or *kurisutaru*, since I never actually found it on any English page). It is soft but very dense and I used a grit 2000 for preparing these boards. It is used to prepare the final layer of *urushi* before polishing. Traditionally, instead of Crystal, very dense and fine charcoal called *roirozumi*, made from Japanese snowbell (Latin *styrax japonica*) or crape myrtle, is used for the same kind of work. As for getting a hold of Crystal, I encountered the same problems as with Green Carbon, finding it only in Japanese shops. In the industry this kind of stone supposedly is used for example for sharpening lenses, so contacting a producer and describing the kind of stone needed might be the best option in this case.

Another sanding tool is charcoal (*sumi*). Before the invention of artificial sharpening stones, different kinds of charcoal were used in basically all stages of creating an *urushi* surface. One is the above mentioned *roirozumi*, other examples are *surugazumi* from the Japanese wood-oil tree (also called tung oil tree) for layers of pure *urushi* and the rough *houzumi* from Japanese white bark





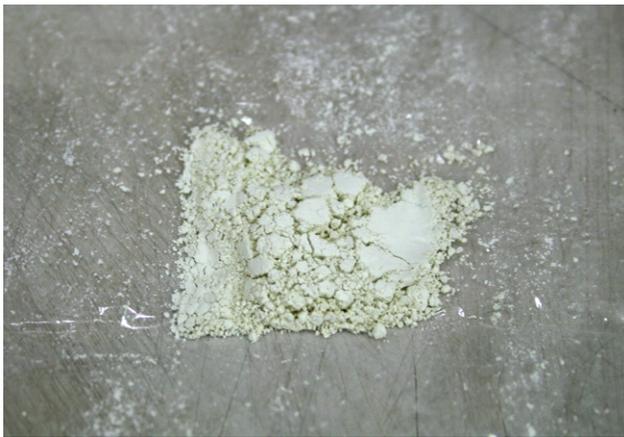
magnolia for groundwork layers. Nowadays mostly *surugazumi* is used while the other two are often replaced by Green Carbon and Crystal.

Polishing powders are the green *douzuri-ko* and the white *migaki-ko*. I personally refer to both of them as polishing powders and group them together because they are used in a similar way and create the kind of surface I associate with polishing. In fact though, *douzuri-ko* technically belongs into the group of tools for sanding.

Douzuri-ko is used in the stage of *abura douzuri*, where the already very finely sanded surface is rubbed with this powder and oil. This further removes material from the surface, but so lightly, that the result looks more like a polished surface than a sanded one. The work is done in stages, first with the help of flannel fabric wrapped around a common eraser, then with a piece of cotton wool, and finally with one's bare hand.

Instead of the green powder, *tonoko* can also be used. It is mixed with oil and then a sheet of *koshigami*, straining paper, is put on top of it. The little oil mixed with fine *tonoko* that seeps through the paper is taken up with a piece of cotton wool and used on the surface.

Migaki-ko, the white powder, is used together with just a tiny bit of oil in the final stage, the actual polishing. This should be done only with one's bare hand. *Migaki-ko* can be substituted with finely ground, calcined deer's horn.



Tonoko is a kind of fine clay-like earth, which is used in a mixture with *ki-urushi* in groundwork layers. It can also be used instead of *douzuri-ko* for polishing.

Tonoko is produced in different parts of Japan, the kind which is being used in Takaoka comes from Kyoto.

Jinoko is another kind of earth used in different mixtures in groundwork layers. The kind used in Takaoka, called *Wajima-jinoko*, is found on the Noto peninsula and usually used exclusively in Wajima. It is used in certain mixtures in groundwork layers to give those mixtures a harder or thicker texture and make them set faster.



Paraffin oil, also referred to as lamp oil or kerosene, is used for cleaning brushes as well as in some cases for mixing with *urushi*.



Basic oil, for example olive oil, is used for cleaning brushes as well as to protect blades from rust. For use together with the polishing powders, rapeseed oil is supposed to be better. For the final polish, my teachers in Takaoka swore by using the oil that develops on the skin of one's own face, it being very fine and available in a relatively small amount, which minimizes the danger of using too much of it.

A small glass jar is convenient for storing oil.

Ethanol, alcohol, for cleaning.

Water is used while sanding as well as in preparing different *urushi* mixtures.



Plastic squirt-bottles are convenient for handling paraffin oil, ethanol and water.

Rice flour is, as the name says, flour made from rice, which is cooked together with water to create a substance called *nori*. Mixed with *urushi* this is mostly used to fix paper or fabric to an object.

Wheat flour, made into a dough together with water and mixed with *ki-urushi* makes for a quite strong glue, used for example to glue wood, or to fix pieces of metal or mother-of-pearl onto a lacquered surface.



Hemp, ramie or even cotton fabric is used to strengthen the board and keep it from warping. Also, fabric or paper are often attached to rims, edges or corners of objects to strengthen them, while in the technique called *kanshitsu*, the object itself is made of layers of fabric, connected to each other and hardened with the help of *urushi*.

Koshigami is straining paper used to clean *urushi* by filtering out for example dust particles or dried bits of lacquer that would later disturb the surface.





(Ocha-)Owan are literally rice bowls used simply to keep *urushi* in. Basically any kind of small ceramic or glass bowl with a smooth surface should be all right. When keeping *urushi* like this it needs to be covered with plastic wrap to keep it from either setting or losing its water content.

Tissues are most convenient in the big dispenser package, because they are being used all the time and above else for cleaning.

Oil-free cotton wool is, as aforementioned, used in polishing as well as occasionally for applying *urushi*.

Disposable rubber gloves and possibly some kind of arm cover might be a good idea for people just beginning to work with *urushi*, as protection against getting the allergy.

Plastic wrap to cover bowls containing *urushi* or generally preserve leftover *urushi* mixtures. The kind of wrap which I used in Japan can be identified by a substance called polyvinylidene chloride, PVDC, and is supposedly better for keeping *urushi* than the thinner version. When doing a short term test I found both wraps to be working, but some caution may be in order in this case.

Waste cloth for cleaning, drying etc.



Urushi

While all *urushi* is derived from the same kind of tree, there are still an unbelievable number of different kinds of lacquer. Numerous criteria like from which part of the tree, in which season and the age of the tree from which the *urushi* is harvested, change the quality of the sap. Then, after refining, there are different kinds of *urushi* for different techniques and objects which it will be used on. This

is going so far as to there being special *urushi* for creating a certain kind of *maki-e* with one certain kind of gold powder, called *nashiji-urushi*. For simplicity's sake I will not go into detail of all those different kinds, but will instead describe only the most common kinds of *urushi*, those, which will with the exception of one be used in the presentational work described later on.



Ki-urushi, the so called 'raw' urushi is basically the sap as it comes from the tree, but strained and thus cleaned of any dirt, dust, pieces of bark etc. It is used in all the groundwork layers of an *urushi* surface, usually in a mixture with other materials like paraffin oil, flour or *nori*, *tonoko* and *jinoko*. For very basic wooden objects sometimes only *ki-urushi* is used as coating.

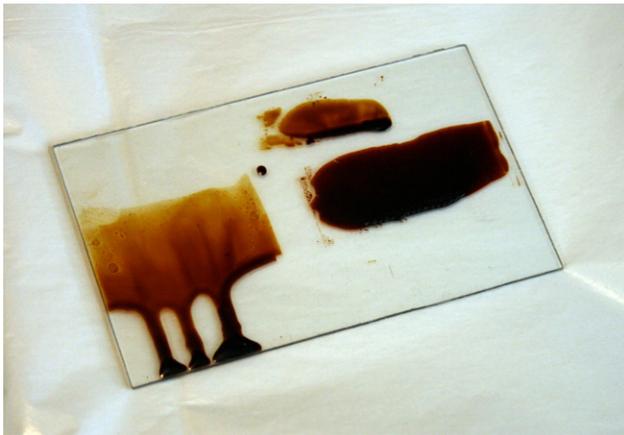


Kijoumi is also *ki-urushi*, but harvested in August and September, months in which the sap of the tree is of an especially high quality. It dries into a harder surface than normal *ki-urushi*, which makes it especially useful for *maki-e*, a technique in which ornaments and pictures are created by sprinkling gold or silver powder. For fixing these powders onto a surface, *kijoumi* is used in various mixes, for example together with a certain iron oxide pigment for *e-urushi* or with *kuroroiro* to make *rose-urushi*. The latter is also used in *raden*, mother-of-pearl inlay or *hyoumon*, metal sheet inlay, using mostly silver or gold. But the most basic application of *kijoumi* is in finishing the surface of polished objects. There, several very thin layers of it seal the surface and fill up all remaining microscopic irregularities to give a high lustre when being polished.



Kuroroiro is black *urushi*, but coloured not through a pigment but through a chemical reaction with iron hydroxide. Therefore the lacquer is not opaque but remains slightly transparent. That is why several layers of it are needed to make a thoroughly black surface and also why this surface will appear to have a certain depth when it is polished.

Also, while it is being produced the *urushi*'s water content is reduced, which results in a lacquer that sets into a slightly more durable surface, which makes it more suitable for the uppermost layers of an object than *ki-urushi*.



Suki-urushi is transparent *urushi*. I have not used it in the making of the presentational boards but decided to mention it as one of the main kinds of *urushi*. Dependant on the producer there can be vast differences in exactly how transparent it eventually turns out to be. Some kinds really dry into a almost colourless surface, others are rather yellowish or amber coloured. Like *kuroroiro*, *suki-urushi*'s water content has been reduced during the production process, which makes it a good top coat for objects painted only with the basic *ki-urushi*. Its main application though is to be mixed with various pigments to create different *iro-urushi*, coloured *urushi*.



Making an Urushi Surface

Preliminary Information

Before finally starting to describe how to make a basic urushi surface, there are again some things that need to be mentioned.

Here I made plain boards to show the easiest all the steps needed to create an *urushi* surface, but the same technique could be used for a wooden bowl or a plate or any kind of object with a wooden base, except for only slight differences. For example in a bowl the fabric might be applied only to the rim, or other more fragile areas.

While here I describe all steps until the high polish finish, only the top and sides of the board are actually polished, while the back has been covered with a textured surface, which I will not explain any further at this point. The back could also have been left at the first layer of *kuro-roiro* for example. Leaving a board or part of an object completely is not a good idea since it can lead to warping.

In many cases in the soon to follow text the reader will notice that I have given quite vague descriptions as to how much of a certain material should be added to a mixture. That is because in many cases there are no exact measurements. Often it comes down to how a mixture should feel or what kind of surface of material it will be applied to, which in turn could be dependent on outside influences like for example humidity. It is, once again, something that needs to be learned through experience with the material.

Before starting to describe all steps in detail, I added a chart with the names of all steps and their basic explanations as well as scans of the finished presentational boards, both in unison to be used as a kind of short guide that can be easily consulted. On the last board unfortunately, because of scanning the board the differences between the remaining stages is very hard to see, but the pictures later on will show the surfaces a little better.

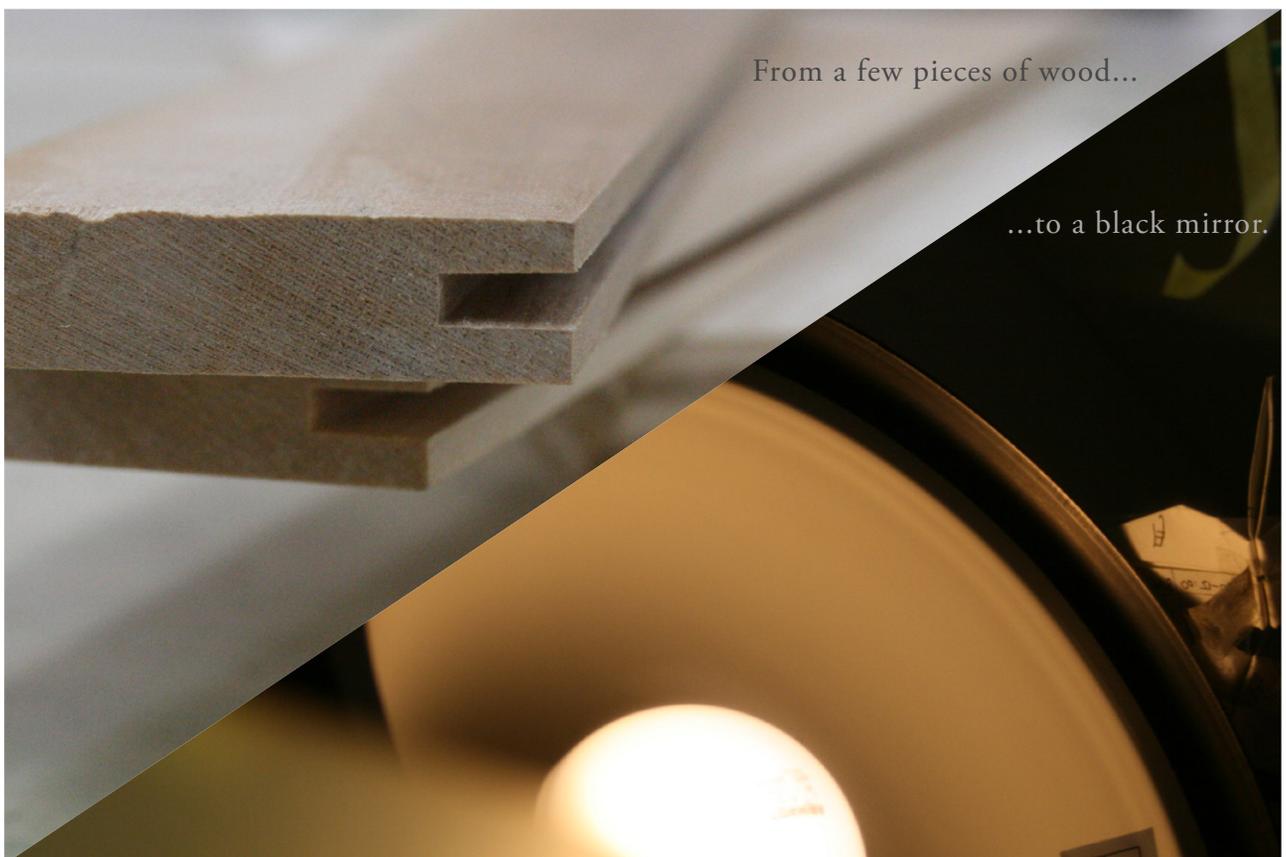


Chart of Working Steps

Step	Japanese Name	Description
1	kiji 素地	base
2	kiji-chousei 素地調整	sanding of the base with fine sandpaper
3	kokuso-bori 刻苧彫り	cutting of a groove over a possible joint
4	kiji-gatame 素地固め	imbuing the base with a mix of 7 parts ki-urushi and 3 parts paraffin oil
5	kokuso-kai 刻苧かい	filling of the groove with kokuso, mugi-urushi (wheat dough and ki-urushi) mixed with hemp fibre and fine wood shavings
6	kokuso-chousei 刻苧調整	sanding of kokuso surface and light sanding of complete base
7	kokuso-kiriko-zuke 刻苧切子付け	filling of possible uneven parts of the kokuso with kiriko, a mix of 10 parts tonoko and 6 parts ki-urushi with jinoko added for a thick, pasty consistency
8	kokuso-kiriko-kenma 刻苧切子研磨	sanding with the result of a completely even base
9	nuno-kise 布着せ	application of fabric by using a mix of 10 parts nori to 8 parts ki-urushi and added jinoko for a slightly thicker texture
10	nunome-zoroe 布目揃え	sanding with rough or medium sandpaper
11	nunome-suri 布目擦り	filling up of fabric mesh with kiriko (see kokuso-kiriko-dzuke)
12	nunome-suri-kenma 布目擦り研磨	sanding with medium sandpaper
13	sabiji-zuke 錆地付け	application of sabiji, a mix of 10 parts tonoko, 6 parts ki-urushi and a little jinoko (not as much as in kiriko!)
14	sabiji-kenma (karatogi) 錆地研磨(空研ぎ)	dry sanding with medium green carbon
15	sabiji-zuke 錆地付け	another application of sabiji
16	sabiji-kenma (mizutogi) 錆地研磨(水研ぎ)	preliminary dry sanding with medium green carbon, then wet sanding with fine green carbon

Step	Japanese Name	Description
17	sabi-zuke 錆付け	application of sabi, a mix of 10 parts tonoko and 6 parts ki-urushi, without jinoko
18	sabi-kenma 錆研磨	wet sanding with medium sanding stone
19	sutenuri 捨て塗り	application of 7 parts kuroroiro mixed with 3 parts paraffin oil
20	sutenuri-kenma 捨て塗り研磨	wet sanding with charcoal
21	tsukuroisabi-zuke 繕い錆付け	filling up of possible dents with sabi (see sabi-dzuke)
22	tsukuroisabi-kenma 繕い錆研磨	sanding of filled up spots preferably with hard, natural sanding stone, or if unavailable a normal medium sanding stone
23	nakanuri 中塗り	application of kuroroiro
24	nakanuri-kenma 中塗り研磨	wet sanding with charcoal
25	uwanuri 上塗り	application of kuroroiro
26	uwanuri-kenma 上塗り研磨	wet sanding with charcoal and consecutively with kurisutaru
27	katame 固め	sealing of surface with 7 parts kijoumi mixed with 3 parts paraffin oil applied by cotton wool
28	abura-douzuri 油桐擦り	polish/sanding with aburo-douzuri (green powder) and very little olive or rapeseed oil
29	suriurushi-ikkaime 摺り漆一回目	further sealing of surface with 7 parts kijoumi mixed with 3 parts paraffin oil applied by cotton wool
30	suriurushi-nikaime 摺り漆二回目	further sealing of surface by kijoumi (without paraffin oil) applied by cotton wool
31	suriurushi-sankaime 摺り漆三回目	further sealing of surface by kijoumi (without paraffin oil) applied by cotton wool
32	roiromigaki 呂色磨き	final polish with migaki-ko (white powder) using only cotton wool and one's hand, preferably with own body oil (nose) or very little rapeseed oil

33
Scans of Presentational Boards



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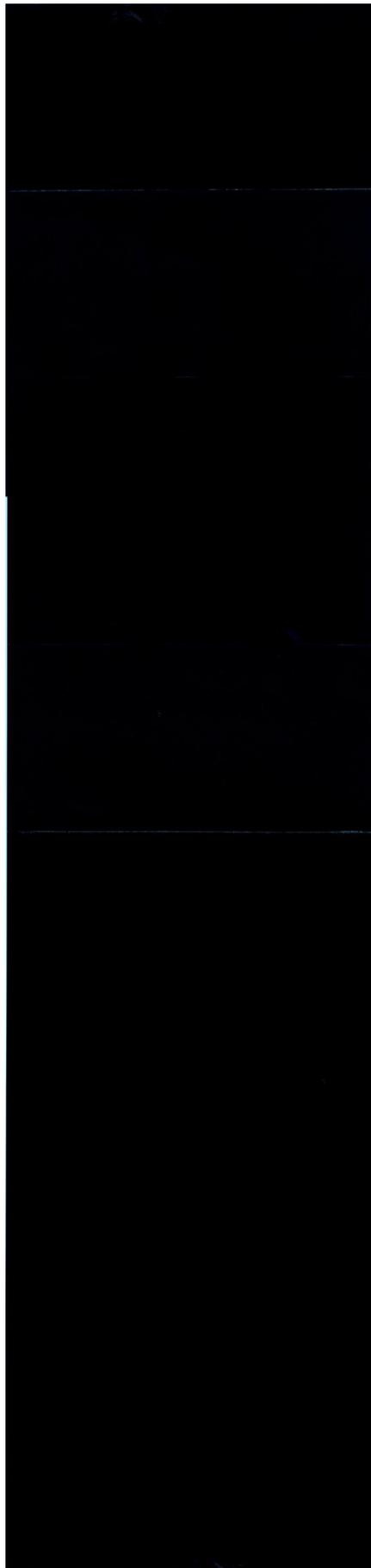
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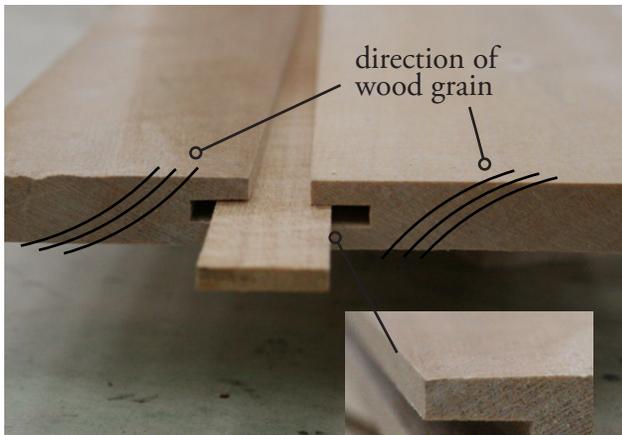
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Detailed ^{4.2}Step-by-Step

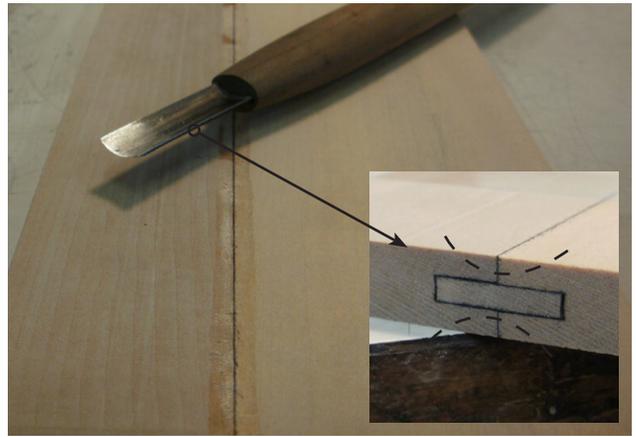


The first step, the base from which to start, is called *kiji*. In this case this describes plain boards of wood. For this work though, to be able to show an additional technique, one of the boards has been prepared from two narrow pieces of wood glued together with *urushi*.

This, the preliminary step, is called *kiji-zukuri*, the preparation of the base. Two wooden boards are cut to be slightly bigger than eventually needed. To create a spline joint for a stronger connection, the sides to be glued are shaped as shown in the picture, bearing in mind that the two pieces should be fitted with their grain running in opposing directions. An additional, slim piece of wood is cut to fit the gap. All three pieces are glued together with *mugi-urushi*, a mixture of flour and *urushi*. A little basic wheat flour and water are mixed and kneaded with a hera into a dough about the softness of one's earlobe. The required quantity of dough is added to about the same amount of *ki-urushi* and everything is mixed until a goopy, sticky paste is created.

All connecting surfaces of the joint, including the slim center piece, are coated with a thin layer of this glue, then pressed tightly together and fixed with clamps.





Since the glue takes relatively long to dry, the fitting can still be corrected and cleaned up. Glue that is pressed out on the sides should be taken off. When everything is fit together tightly and the surfaces cleaned, the piece is placed in a *furo* with the humidity at about 60%. The clamps can be taken off after a day, but the piece should remain there to set completely for about a week. Taken from the *furo*, the board is cut and planed to final size, thus creating the aforementioned *kiji*.

The following *kiji-chousei* is the sanding of the wood. Fine sandpaper is attached to a small block of wood and the board is sanded. Corners and edges are slightly rounded to ease the later application of fabric.

In the place where the two pieces of wood are connected, a shallow, rounded groove is cut over the joint on both sides using a wood chisel. This is called *kokuso-bori* and the resulting hollow will soon be filled with a substance called *kokuso* to further strengthen as well as buffer the point where the two smaller boards are connected by glue. Should the wood warp and so move the edges of the connection in any way, then the *kokuso* will prevent a gap from appearing on the surface.

But before the filling of the groove comes *kiji-gatame*, the hardening of the base. This is done by coating it with 7 parts *ki-urushi* mixed with about 3 parts paraffin oil. Ideally the whole board is covered all at once and then placed in the *furo* in a way that the layer of *urushi* isn't disturbed. Very handy are long, thin sticks with a triangular cross-section. If those or something similar aren't available, the board can also be coated in two steps, first one side, then the other, so each time the board can be placed in the *furo* on a dry side. Every coating is set for a day and after that the board is left in the *furo* for another 3 days to make sure that also the *urushi* which has soaked deeper into the wood is set completely.

Now, in *kokuso-kai*, the groove over the joint is filled with the aforementioned *kokuso*. This is made of flour dough, a little hemp fibre, *ki-urushi* (about the same amount as the wheat dough) and fine wood shavings. For the fibre, simply cut a very small square of hemp fabric into tiny pieces. The wood shavings on the other hand, should neither be too small, nor too big. If too big, the even application of the final mix will be troublesome, too small and the whole mix might not set. Saw dust from hand sawing should be suitable, even better yet if sieved through mesh 40 or 80. A lot of the saw dust needs to be added. In fact as much as possible, until the substance becomes so tough that it seems impossible to mix it any further. Use a hard, strong hera for this, best would be a *takebera*, the spatula made of bamboo.





With the same spatula the *kokuso* is now pressed into the groove and smoothed out to create an even surface with the rest of the board. It needs to set for about a day at around 60% humidity.

Then the *kokuso* is sanded, which is called *kokuso-chousei*. Medium sandpaper is suitable for this and the rest of the board should be sanded lightly at the same time, too.

While setting, the *kokuso* might have shrunk in some places or the area might turn out a little uneven after sanding. To correct this, *kokuso-kiriko-zuke* is needed, the application of *kiriko*.

The weight of a still dry piece of *tonoko* is measured and noted, then, placing it on the *jouban*, water is slowly sprinkled on top of it. When the *tonoko* doesn't soak up any more water on its own and starts to fall apart, it is mixed with a *hera* until a smooth paste is created. *Ki-urushi* is added by weight in the relation of about 6 parts of *urushi* to 10 parts of *tonoko*. When all is mixed, and the relation right, the paste should show traces of a oily, dark brown sheen when spread out.

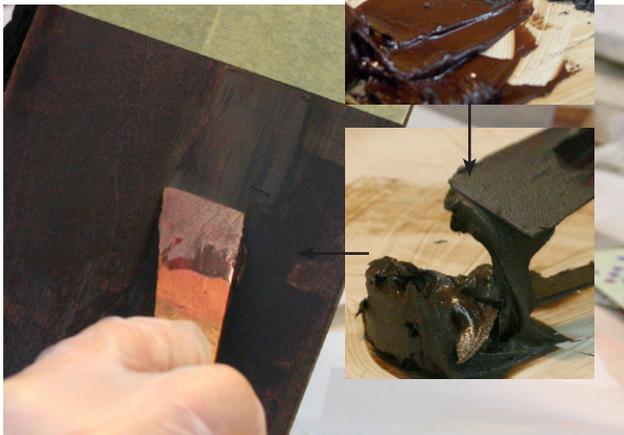
The final addition is *jinoko*, not much of it but just enough to thicken the paste into a texture like that of soft ice cream.

The finished paste is applied over the *kokuso* as smoothly as possible with a hard *hera* and is set for at least 6 hours. Then the area is once again sanded (*kokuso-kiriko-kenma*), leaving the board completely even for the next step.

Nuno-kise is the application of mesh 80 hemp fabric, which is done to strengthen the board, keep it from warping, as well as to further hide the wood grain from later showing through the *urushi*. *Nori-urushi* with added *jinoko* is used as glue in this case. 1 part rice flour is mixed with 4 parts water in a small saucepan until there are no clumps left. Then it is heated while being stirred, taking it off the heat as it starts to thicken. Under further stirring it turns into a very soft, transparent white substance, which is left to cool.

The desired amount of *nori* is mixed with *ki-urushi* in relation of 10 part *nori* to about 8 parts of *ki-urushi*. Lastly *jinoko* is added, this in volume about a quarter or less of the already created *nori-urushi*.

The *jinoko* isn't really meant to make the substance much thicker, but just to give it a slightly heavier texture, making it a little easier to use together with the fabric. The basic *nori-urushi* without *jinoko* could be used as well, the choice is mostly down to personal preference.





The fabric is cut to create two different pieces for each board. One piece to cover the top of the board and the long sides, the other for top and short sides. In both cases the fabric needs to be slightly bigger than actually needed on all sides. Another thing to consider is to cut the fabric so the mesh runs diagonally over the board, which will strengthen the wood better from warping than if the fabric's mesh followed the wood's grain. Now the glue is spread on the board, either top and long sides or top and short sides, according to which piece of fabric will be used. The fabric is placed on the board and carefully smoothed out and pressed down with a *hera*, but without pulling the weave out of shape. While it needs to be evenly attached without any air left beneath, it should not be pulled out of shape, since it will try to return to its original form when the glue sets. The surplus parts of the fabric are glued on even over the edges, to make sure that the fabric on the edges itself is attached completely and all the way. On the sides where excess fabric meets, it is folded carefully like one would fold the paper when wrapping a package.

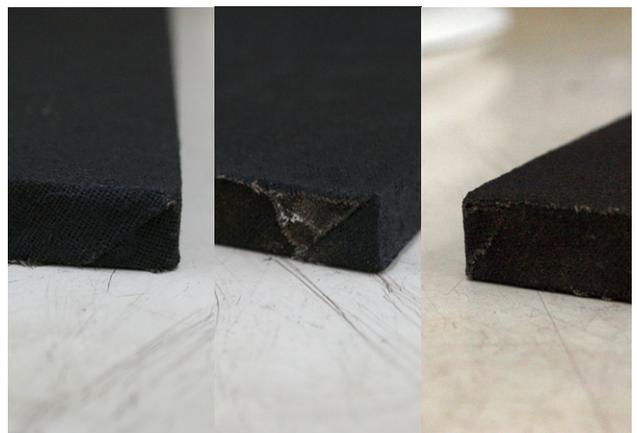
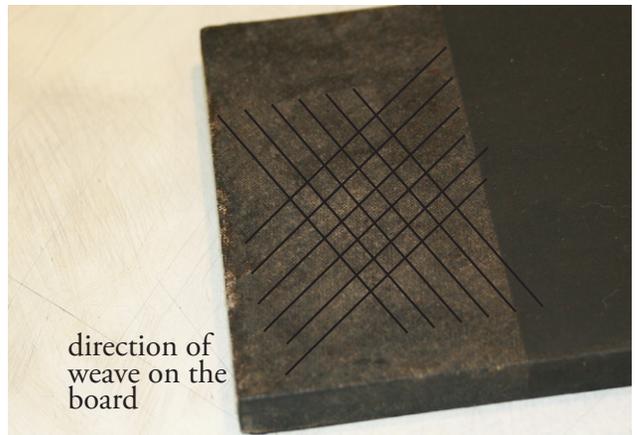
After gluing, the boards need to be set for about a day in the *shimeshiburo*, the 'wet' furo. Then the surplus fabric is cut away with a knife, including the thick, triangular lumps of the 'wrapped' sides. On the two sides that are completely covered, a small triangle is cut off each end. This will in turn be filled by folded fabric from around the corner when the second piece of fabric is attached. The reason for this is to fully cover the most vulnerable edges as well as minimize the risk of fabric peeling off at the corners in later steps.

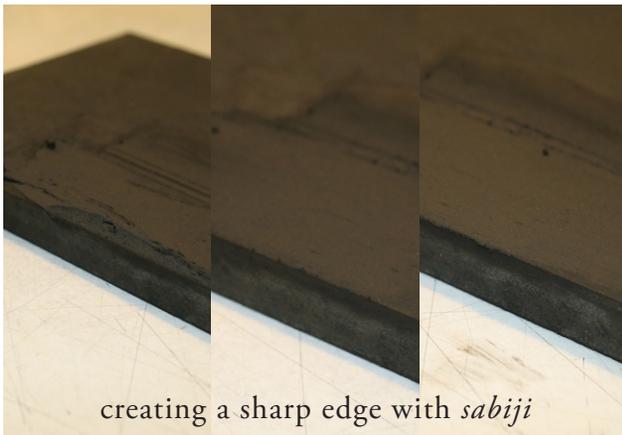
The second piece of hemp is attached the same way as the first, only now covering the other side of the board. Then all is set again for another day and afterwards all excess fabric cut off, leaving the board with exactly one layer of fabric on all sides.

If there is an air bubble anywhere, the fabric there needs to be cut off and a smaller piece glued over the hole to repair it. When the glue has been set, the edges of that part need to be carefully cut down until the surface is level with the rest.

When the layer of fabric is complete, it is sanded with rough or medium sandpaper (*nunome-zoroe*). Then the remaining fabric texture is filled up in *nunome-suri*. This is done with *kiriko*, the same substance already used to fill up the *kokuso* before.

It is applied again with a hard *hera*, pushing it into the fabric's texture and scraping it into an even surface on top. This needs to be done fairly fast, as *kiriko* tends to dry out quickly. As before, *kiriko* needs to set for at least





creating a sharp edge with *sabiji*



karatogi

6 hours after which follows *nunome-suri-kenma*, sanding with medium sandpaper. Now starts the work which is meant to make the surface of the board as even and straight as possible. For the first step, *sabiji-zuke*, a substance is used which is in its making basically the same as *kiriko*, but this time a little less *jinoko*, which makes this *sabiji* easier to apply evenly. To get sharp edges, a little more *sabiji* is applied near the edge, smoothed out so the surplus *sabiji* is pushed over this edge and then 'cut off' with the *hera* from the other side.

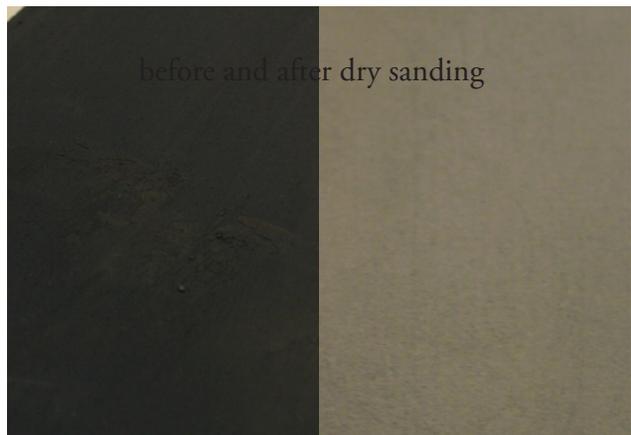
Now that it is important to get an even surface, it is more convenient to work in two steps: coating first one top side and two opposing narrow sides at once and when those are set, the rest.

The sanding after the first layer of *sabiji-zuke*, *sabiji-kenma* (*karatogi*), is done with medium green carbon. A small piece of it is flattened against a bigger piece of the same kind of stone and then moved onto the board. While sanding, a rough dust is created which should not be wiped off, but instead used itself for sanding. Once in a while the sanding surface of the stone needs to be flattened again, to take off the *sabiji* dust accumulating on it.

The sanding generally should for the most part be done in a circular motion, gradually moving over the whole board to make it even. A metal ruler is handy for controlling this. It is put with its edge onto the board and board and ruler together are held against the light. Where light shines through a gap the area is lower than the rest and the surface around it needs to be sanded accordingly.

The *sabiji* layer will probably be broken, which means the *kiriko* from the layer before, or even the texture of the fabric might be sanded out from beneath it. Which is why the following layer will be *sabiji-zuke* again, another application of *sabiji*.

The sanding of this second layer is called *sabiji-kenma* (*mizutogi*), *mizutogi* standing for wet sanding using fine green carbon with water. Still, it is better to first start as before using the medium green carbon and sanding dry. If the layer is still broken badly and in many places, especially if the texture of the fabric comes through again, *sabiji-zuke* needs to be repeated more often. Trying to get the board to an even surface now is important, since *sabiji* creates a much thicker layer than the subsequent coatings of *sabi* and black *urushi*. Getting a thick layer flat without breaking it is of course easier than doing the same with a thinner one.



before and after dry sanding



Only if the *sabiji* layer seems to stay intact or only slightly broken, should the medium green carbon be switched for the fine version, which is used in combination with water. It is flattened against a medium grit sharpening stone placed in water and the sanding is done wet as well. The addition of water, and the finer stone allows for two more ways to control the evenness of the surface. While sanding, the stone will probably start to 'stick' to some areas while moving smoothly in others. The areas where it sticks are lower than the rest, it moves smoothly over heights. Thus, of course, the areas where it moves easily should be sanded more than the areas where it sticks.

Another way is controlling the surface by the reflection of light. The board is cleaned in between sanding, for example with a small sponge, then dried with a cloth and held up against a light source. When tilting the board slowly, the light moves over it, 'dipping' in lower places. This way the whole board can be examined and the sanding adjusted accordingly.

When the whole surface is sanded and the layer still intact, or at least not too badly broken, the work continues with *sabi-zuke*, the application of *sabi*.

As in *kiriko* and *sabiji* a piece of *tonoko* is taken and the weight noted, then water is added and it is broken up and mixed well. *Ki-urushi* is added in relation 10 parts *tonoko* to 6 parts *urushi*. This time though, the *jinoko* is left out.

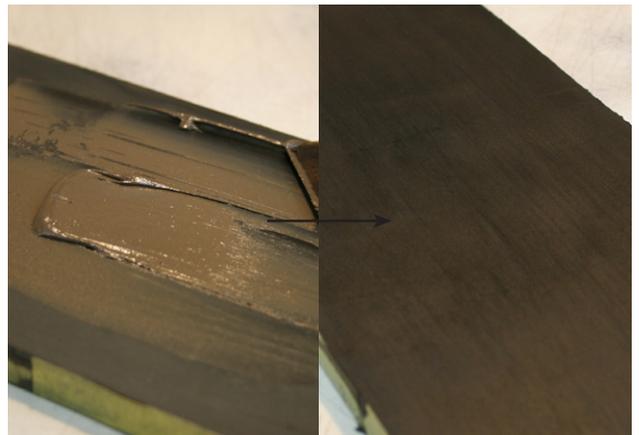
Sabi is also applied with a *hera*, evenly and thinly and then placed in the *furo*. It is more unreliable in setting than *sabiji*, also depending on the weather, but one day should usually be enough to set it. If, when scratching the surface it feels dry and the nail leaves a light mark, it is set and can be sanded.

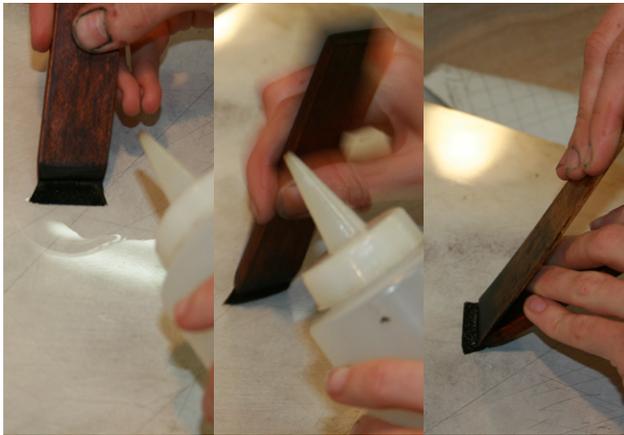
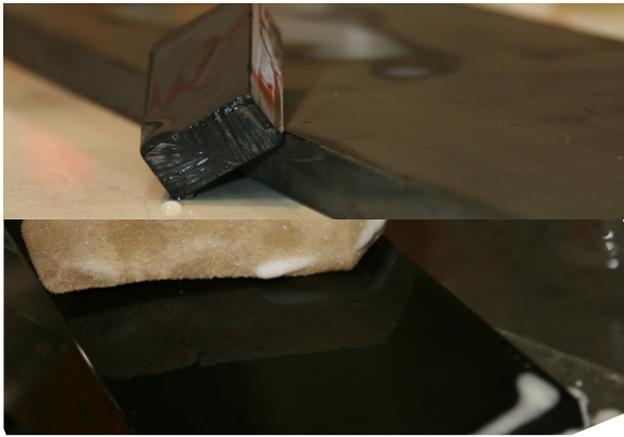
In *sabi-kenma*, the sanding is done wet with a small piece of a normal medium sharpening stone. It is flattened against a big stone of the same kind and the sanding done the same way as before: in circular motion, working towards evenness, controlling the surface through the feeling while sanding, through a ruler and through the reflection of the light.

Even if the layer of *sabi* still breaks, no second layer of the same is added, but instead, with *sutenuri*, the first layer of *kuroroiro*, black *urushi*, is applied. Before that, the edges of the board need to be just very slightly dulled, as well as smoothed. A natural, very hard and very fine sharpening stone used wet is ideal for this, but if it isn't available, then the fine green carbon or a grid 800 King stone works as well. If the edges remained too sharp, the liquid *urushi* wouldn't cover them because of



in these cases, *sabiji* needs to be repeated





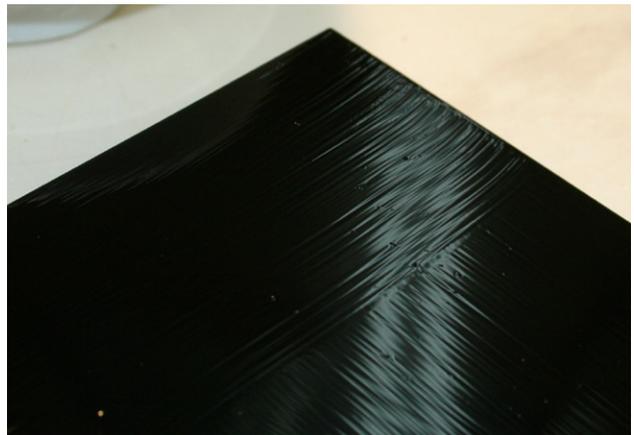
surface tension. If the edge is slightly dulled, the *urushi* will cover it better. The board also needs to be washed to eliminate any oil or other dirt that could interfere with the setting of the *urushi* into a smooth, even layer. The washing is done with basic dishwashing soap, then wiping the board dry carefully with a soft sponge. Needless to say, one should not touch the surface with one's bare hand anymore after it has been washed.

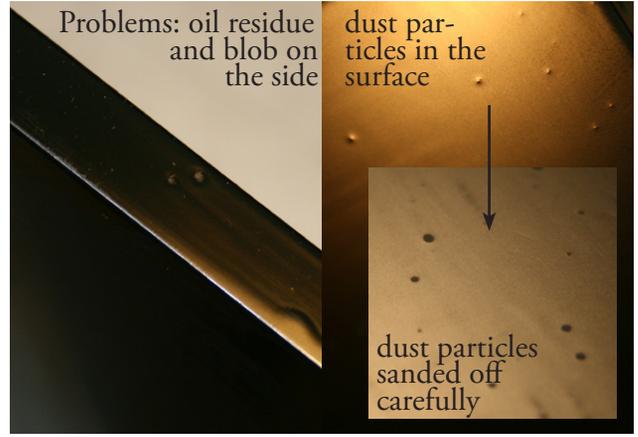
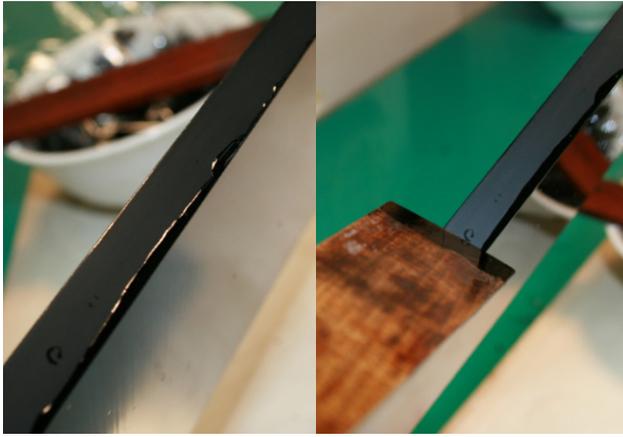
The room or area where the painting is done should be as dust-free as anyhow possible. The less particles of dust settle on the freshly painted surface or are enclosed in it, the easier it will be to sand that same surface evenly afterwards. Even though enclosed particles of dust cannot be seen anymore after sanding, if the sanding of that part isn't done very carefully, a small hole may appear.

The *hake*, the brush for the application of *urushi*, needs to be cleaned thoroughly as well. It is soaked in paraffin oil, then moved repeatedly back and forth on the *jouban* and afterwards the oil is pressed out of the brush's hairs with a hard *hera*. This is repeated several times until there seem to be no more small particles of dust or old, dried *urushi* left in the pushed out oil. Now to in turn get rid of the paraffin in the *hake*, it should not be dried against a tissue, since that would just add dust particles, but instead it is cleaned with the same kind of *urushi* that is also going to be used in painting, in this case *kuroroiro*. This is done the same way as with oil: dipping the brush in clean, that is strained *urushi*, brushing it back and forth on the *jouban* and pushing the *urushi* out with a *hera*. About three times should be enough. The now dirtied *urushi* should be collected separately. It can be used again for painting *sutenuri* or *nakanuri* after cleaning it again by straining it.

Now *kuroroiro* is mixed with about 30% paraffin oil and is then applied first in narrow lines as a grid, then spread out in the same pattern over the whole board. First horizontal lines, 'filling' the board from top to bottom, then vertical, from one side to the other, one stroke always slightly overlapping the one before. The pattern is repeated several times, always turning the board around in between so the *urushi* is spread evenly and doesn't accumulate on one edge. Blobs on the edges should be avoided.

The narrow sides of the board are painted in the same pattern, alternating horizontal and vertical brush strokes. The finishing strokes should be horizontal strokes, as lightly as possible, followed by one vertical stroke at each end to smooth out possible blobs. Blobs that might have appeared on the sides from painting the top should be scraped off with a *hera*. The board is being painted in two steps again, so it can be placed in the *furo* without





disturbing the fresh layer of *urushi*.

If the layer of *urushi* applied is very thick and in danger of shrinking if set too fast, the board should be placed in the *karaburo*, the *furo* with lower humidity first, and after a few hours changed into the normal *furo*. There, it should set in about 8 hours. After painting, the *hake* is thoroughly cleaned with paraffin oil as described before. The layer just created is called *sutenuri*, the 'sacrificed paint', because on all except very well prepared, straight, even surfaces the layer will almost certainly be broken while sanded, or retain unsanded 'holes' which need to be filled up afterwards. On a straight surface like the presentational boards in this case, when the groundwork has been done well, even this first pure *urushi* layer can in the best case scenario remain unbroken. In any case, professional craftsmen will rather choose to sand this layer too little instead of too much, to keep a thicker, unbroken layer of *kuroroiro*. Instead of breaking the layer it is preferred to rather leave lower places un-sanded and fill them up with *sabi*.

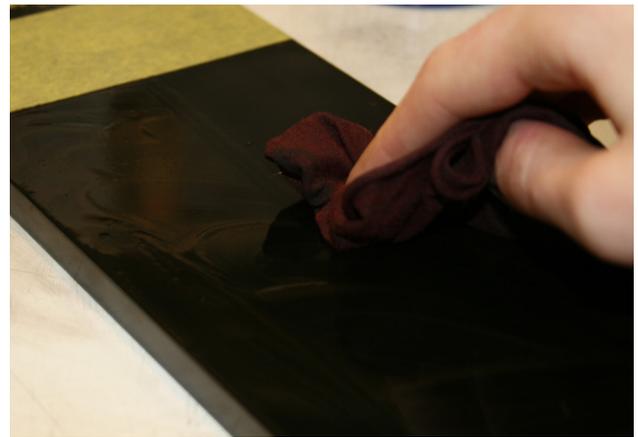
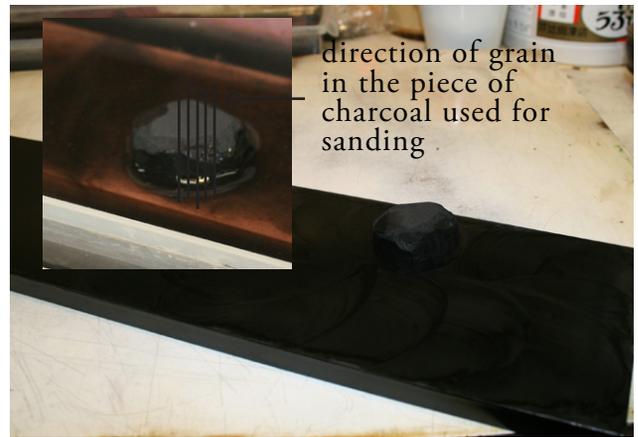
As for the sanding, *sutenuri-kenma*, charcoal is used. It is cross-sectioned and cut into a roughly square shape with rounded corners. If it is narrower and rounded towards the top it will be easier to hold.

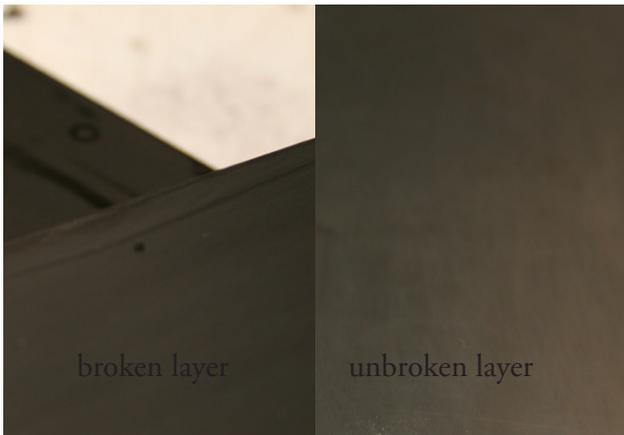
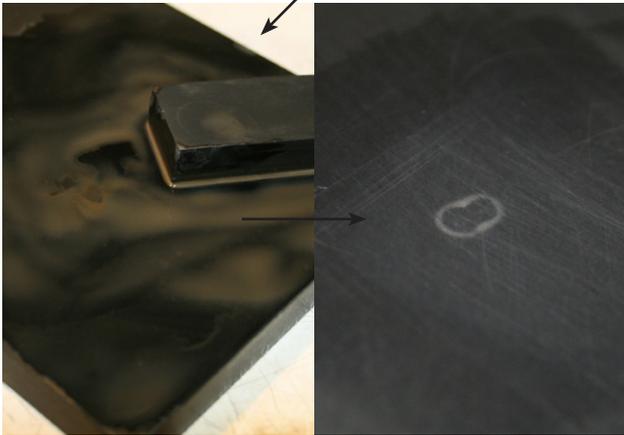
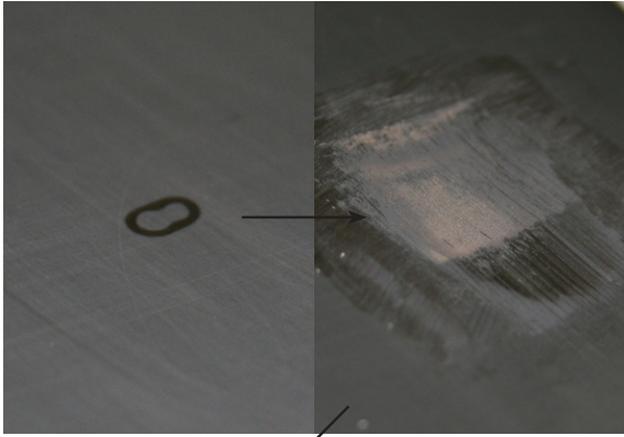
If there are dust particles encased in the *urushi* surface, those need to be sanded off very lightly and carefully before the whole board can be sanded with normal pressure. If not, those particles might be ripped off and leave a little pinhole behind.

Otherwise the sanding basically works as with the other materials before. The sanding is done wet and in circular motions, the piece of charcoal is regularly flattened against the medium sharpening stone.

The evenness of the sanded area is checked by the feeling of the charcoal against the board, by cleaning it and watching the reflection of the light, or by using a metal ruler. Whereas with *sabiji-zuke* and *sabi-zuke* it was preferable to break a layer to get the surface completely flat, in this case it is better to leave a low area un-sanded instead, in favour of keeping the layer intact.

If there are those areas, or smaller indentions for example because of dust or oil, they are filled up with *sabi*, which is prepared as explained before in *sabi-zuke*. In this step, called *tsukuroisabi-zuke*, the *sabi* is applied to the area where it is needed with a *hera* and carefully scraped to an even surface. Since it is very soft it might need several tries until it covers the lower area well and evenly. When it has set it is sanded in *tsukuroisabi-kenma*. The sanding is done with a natural, very hard, fine sharpening stone, but if that is not available, the normal





grit 800 sharpening stone can be used, but very, very carefully. When sanding the stone needs to be moved on and around the applied *sabi* to end up with a surface that is then even in its entirety.

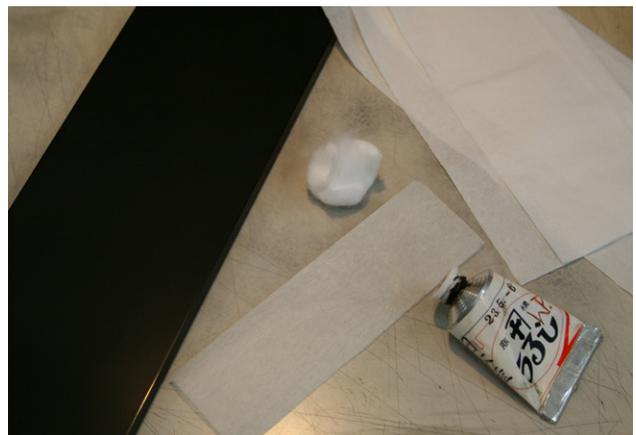
With this acquired, the next layer of *kuroiro*, *nakanuri*, the 'middle paint', is applied. Again the board needs to be cleaned thoroughly before, the brush needs to be washed with paraffin oil and *urushi* itself and the painting should be executed in a grid pattern, as all described before in *sutenuri*.

Nakanuri-kenma, the sanding, is done with charcoal, also as described before. By now it is vital that the layer remains unbroken and completely even after sanding. If it doesn't turn out thus, another layer of *kuroiro* needs to be added and sanded and the whole process repeated until the layer remains whole and even.

The last layer of *kuroiro* is *uwanuri*, the top coat. Applied the same as the two times before in *sutenuri* and *nakanuri*, with *uwanuri-kenma* it is also sanded the same as those two times before. But this time, when the sanding with charcoal is done, charcoal is switched for *kurisutaru*. It is prepared much the same way as the charcoal, in a small square or rectangle shape with rounded corners, slightly narrowing toward the top. The reason for sanding with *kurisutaru* is to eliminate all deeper scratches that might have been created through the charcoal. They will be substituted, in a way, with many much smaller and shallower scratches that can then much easier be compensated in the next step, called *katame*.

This *katame*, like the *gatame* in *kiji-gatame*, basically means to harden a surface or soak it with *urushi*. At the start the wood was prepared by painting it with *ki-urushi* to which about 30% paraffin oil had been added. This time the surface of the last sanded layer of *kuroiro* will be sealed with *kijoumi*, a much higher quality *ki-urushi*. Beforehand the boards of course need to be washed again.

Then, a very small amount of *kijoumi* is strained through a small piece of straining paper and then mixed with about 30% paraffin oil. To be able to apply this as thinly as possible, a piece of cotton wool is used. It is dipped lightly into the *kijoumi*-oil mix and applied in small circular motions over the whole board. This is repeated a few times until there is a thin, even layer of it. To take off the excess *urushi*, a tissue is folded several times and moved lightly over the board in the same circular motion and pattern as the cotton wad. After going over the board once, the tissue is refolded to a clean patch, and the board is swiped again. This is repeated until there are only very few stains of *urushi* left on the tissue,

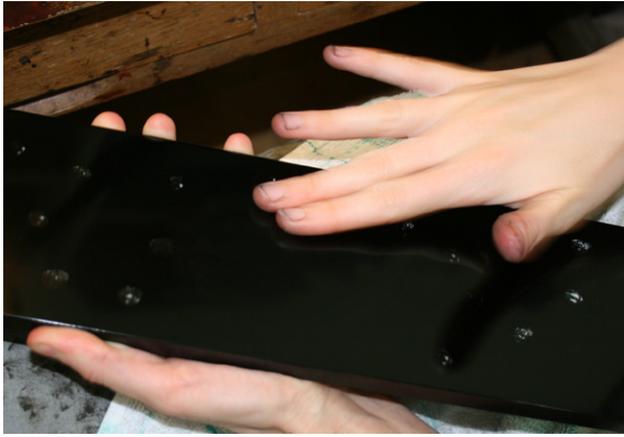




usually this takes about 3 to 4 times. Then the tissue is once more folded to a clean side and this time the board is swiped, very, very lightly horizontally, and vertically. Now there should be no particles of dust or fibres of the cotton wool left on the board and it should have a soft matte surface. It is placed in the *furo* for at least 6 hours. What follows is *abura-douzuri*, a preliminary polish with oil and *douzuri-ko*. The board is prepared with a little basic salad or rapeseed oil, not more than a few fingertips of it, spread evenly with the heel of the hand. A little of the green polishing powder is added and then, for the first stage, a piece of eraser wrapped in flannel fabric is used. It is moved over the board in the same circular motions as known from sanding, but with a lot of pressure. It is moved slowly over the board, always advancing a little way at a time, so the difference between processed and unprocessed area can be seen. If some small particles are being rubbed off, comparable to what happens when using an eraser on a piece of paper, then the ratio of oil and polishing powder is good. Once in a while it might be necessary to do the preparation with oil and *douzuri-ko* again and change from a dirtied patch of flannel to a clean one. About 2 to 3 times going very thoroughly over the whole board should be suitable before the preparation with oil and powder is done again but the flannel is changed for a piece of cotton wool. Again the whole board is prepared with oil and polishing powder and treated several times with the cotton wool. Oil and powder are added anew in between, a very dirty and clogged piece of cotton wool is changed for a new one. Lastly the whole procedure is done only by hand, using the fingers and the heel of the hand. In this stage the oil and powder will stay longer on the board, so just a little amount of *douzuri-ko* is added repeatedly in between, which then will combine with the remaining oil and slowly be rubbed off.

When the polishing with flannel, cotton wool and hand has been done once, the board is examined for scratches. If there are still any deep scratches anywhere, they are again sanded lightly with *kurisutaru* and water to break up their sharp edges, then the whole process of polishing like before is repeated once more. This is repeated as often as needed to get rid of any big scratches before the board is prepared for the actual, final polishing with *suri-urushi ikkai-me*, *nikai-me* and *sankai-me*, literally *suri-urushi* the first, second and third. The first is in fact exactly as the *katame* before *abura-douzuri*. A little amount of *kijoumi* is strained and mixed with 30% paraffin oil, then applied with a piece of cotton wool and the excess *urushi* taken off with a tissue. The second and





third are basically the same, too, but without the added paraffin oil. Each layer is set for at least 6 hours, the last for at least 8.

Now that the last scratches have been filled up, comes the final polish, *roiromigaki*. This should be done either first with cotton wool and then by hand, or completely by hand. With eraser and flannel the risk of making bigger scratches is too big.

The board is prepared with just very little oil, less than used in *abura-douzuri* before, and now the white polishing powder, *migaki-ko*, is added very sparingly on top of this. Otherwise, the polishing is the same as before. Moving the piece of cotton wool or one's fingers and heel of the hand in circular motions with much pressure over the whole board. This needs to be done for a long time, back and forth, adding new oil and powder in between when needed until there are no scratches left and the surface is a deep, even black.

If, for some reason new scratches appeared or old scratches were too deep to be filled completely by *suri-urushi*, they should nevertheless not be sanded again. Instead, *suri-urushi* can be repeated two more times without the addition of paraffin. Then the board is polished again. If still needed, *suri-urushi* is done once more, and polished again.

After that the board should be finished.



5 Recipes

Mugi-urushi

From water and wheat flour a dough is created to be about as firm as one's earlobe. This is mixed with about the same amount of *ki-urushi* to make a sticky substance used as glue.

Kokuso

Mugi-urushi is the base into which a little hemp fibre and a lot of wood shavings from a hand saw sieved through mesh 40 or 80 are mixed. Hemp fibre is mixed in first, then as much wood shavings as possible are added.

Sabi

Take as much *tonoko* as needed and note its weight. Sprinkle water over it and let the *tonoko* soak it up until it will take no more. If necessary, either soak up surplus water with another piece of *tonoko* or split a bigger piece in half so the water can be absorbed better. Mix with a *hera* into a smooth paste. Measure out 5-6 parts *ki-urushi* to 10 parts *tonoko* in weight (calculated with the weight of the dry *tonoko* that was noted before) and mix well. If the ratio is correct then the paste should have an slightly oily sheen when spread out with the *hera*.

Sabiji

Prepared the same way as *sabi*, then *jinoko* is added, in volume roughly $\frac{1}{4}$ compared to *sabi* to make the mixture firmer and easier to dry.

Kiriko

Sabi is created as above, but this time in a relation of 5-6 parts *ki-urushi* (ARGH same as ABOVE!) to 10 parts *tonoko*. *Jinoko* is added, but a little more than in *sabiji*.

Suri-urushi (*touyu* added only for the first or first two layers)

Strain the desired amount of *kijoumi* with straining paper. Add 3 parts paraffin oil to 7 parts *kijoumi*. *urushi* for *ki-gatame*, *katame* and *suri-urushi* *ikkaime*: strained *Kijoumi* (normal *ki-urushi* for *ki-gatame*) is mixed with paraffin oil in a relation of 7 parts *urushi* to 3 parts oil

Nori-urushi

Basic *nori-urushi*, for mesh 80 hemp

1 part rice flour and 4 parts water are mixed under heat and stirred constantly to remove all possible lumps. When the mixture starts to congeal it is taken off the heat and then stirred further until into a smooth paste. Let it cool and then spread the desired amount on the work board. Mix 10 parts *nori* with 8 parts *ki-urushi*.

Nori-urushi with *jinoko*, for heavier mesh 40 hemp though it can be used with mesh 80 as well. (pros and cons! If with mesh 40 then it fills up the fabric texture well so you don't need to do much after... etc)

1 part rice flour and 4 parts water are mix under heat, being careful to take out all lumps until mixture gets somewhat thicker and turns a whitish transparent. Add 8 parts *ki-urushi* to 10 parts *nori*. Add *jinoko*, just enough to give the substance a slightly thicker texture.

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