

刀剣の研磨工程について

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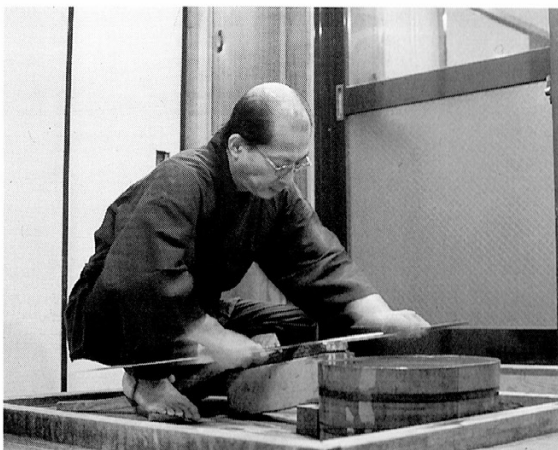
はじめに

刀剣研磨の工程は、前半の姿造りを完成させることを主題とした「下地研ぎ」と、後半の刃文と地肌の美しさを現すことを主題とした「仕上げ研ぎ」の二つの工程に分けられます。また、仕上げ研ぎには「差し込み研ぎ」と「刃取り研ぎ」との二つの手法があります。今回の事業の研磨は全て差し込み研ぎによる仕上げを行いました。その利点も含め現在一般に多く行われている刃取り研ぎとの比較を加えて解説しました。

研磨に取りかかる前には、刀身の錆の深さや形の様子を見るばかりでなく、刀身の鍛え傷などの有無も十分に検討し、研磨の基本的な方針を決めていきます。刃こぼれや錆の大きさによっては敢えて残す場合や、鍛え傷が大きくなりそうな場合は、その付近の刃こぼれや錆を残すこともあります。また、研磨を行わない、或いはごく一部だけを研磨するなどの対応も考えます。なお、刀身のなかごにあたる部分は、作刀当時から古い錆も鑑賞対象としており、決して研ぐことはありません。

下地研ぎ 荒砥～細名倉

下地研ぎで最初に当てる砥石の選択は、錆の深さや形の不具合の強さから判断します。一般に松浦砥・笹口砥等の荒砥は、刀鍛冶から預かった打ち下ろしの刀の場合や、古作でも極めて深い錆の場合に用いられます。備水砥・伊予砥等は、古作の刀剣の錆の深い場合と姿のムラが強い場合、改正砥は錆がやや深い場合とムラがやや強い場合、名倉砥や細名倉砥は浅い錆の場合とムラが小さな場合に選択します。内曇砥では錆やムラはほとんど取れませんが、切先などの丸みの強い部分では小さな錆やムラは取り除くことが出来ます。ただし、これらは刀身の堅さなどによっても幾分異なってきます。また、今回の修復対象の刀剣は、錆が特に深い状態ではなかったため、荒砥は使用せず備水砥以降からの研磨作業となりました。



6 下地姿勢 (内曇砥)
Shitaji process (uchigumori-to)



7 下地作業 (備水)
Shitaji process (binsui-to)

実際の下地研ぎ作業は、刀身を両手で持ち、ふまえ木（図版6 右足かかとで踏んでいるのがふまえ木）で固定された砥石の上で刀身を動かして研磨します。この時、左手は素手で右手は布を巻いて刀身をしっかりと保持し、右腕の脇下を右足の膝上に乗せることで腕の動きが安定します。

荒砥・備水砥・改正砥では刀身を前後に動かし、砥石目を荒砥の時は棟に直角近くに、備水砥・改正砥では砥石目を少しずつ斜めにして前の砥石目を除去します。名倉砥では砥石目を棟に平行になるように刀身を左右に動かし、僅かにしゃくるような動作を加えて砥石目を整え、細名倉砥へ進めます。この砥石目の平行への転換を、改正砥で行う場合もあります。また、それぞれの段階の砥石に粒度の大小があるため、例えば細かめの名倉砥を当てた場合には、細名倉をあてずに内曇砥に進む場合もあります。

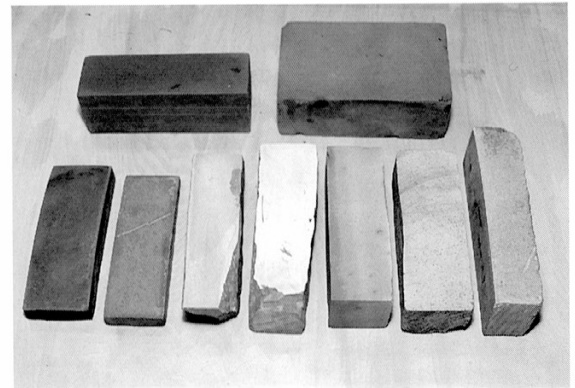
刀身への砥石目の角度は、棟に直角に近いほど一度に刀身に当たる範囲は狭くなり、刀身に強く働くため目的の形造りを行うことができます。ただ、配慮なく行えばムラができるおそれも強くなります。これらを考慮しながら作業を進め、内曇砥が当たる細かさの砥石目を棟に平行になるように整えます。

荒砥から細名倉砥までの砥石は、良質の天然砥が産出しなくなってきたのに対し、人造砥石の質は次第に向上し、天然砥にも時折見られる粒度のムラがほとんどなくなり、刀剣研磨にも充分使用できる物が入手できるようになっています。人造砥の粒度は、対応する粒度の天然砥の名前であげると、荒砥は#120~220、備水砥は#400、改正砥は#600、名倉砥は#800~1200、細名倉砥は#1500~2000相当の粒度のものにあたります。

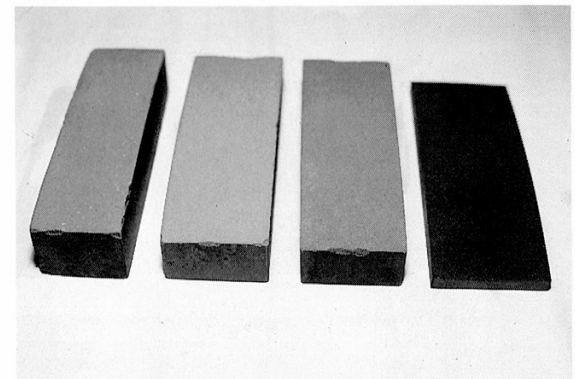
天然砥は良質な砥石を使用し砥石面を充分観察しながら作業を進めても、不意に現れる小さな石気に刀身があたれば作業を元に戻さねばなりません。一方、人造砥を使用する場合は、同じ作業場で仕上げ作業を行うと微細なキズが付くことがあります。このため人造砥を用いる作業場は、天然砥を用いる仕上げ場とは別の場に設ける、或いは充分な洗浄を行うなどの配慮が必要です。下地作業に用いる砥石の選択には、これらを勘案し実際の砥石を選別するこ



8 下地作業（名倉砥）
Shitaji process (nagura-to)



9 天然砥石 Natural whetstones
(右から 伊子砥 備水砥 改正砥 名倉砥 細名倉砥 内曇砥<刀砥> 内曇砥<地砥> 上段右から大村砥 青砥<つや造りに用いる>) (from the right: iyo-to, binsui-to, kaisei-to, nagura-to, komanagura-to, uchigumori-to:ha-to, uchigumori-to:ji-to)



10 人造砥石（右から 荒砥 備水砥 改正砥 名倉砥）
Artificial whetstones (from the right: ara-to, binsui-to, kaisei-to, nagura-to)



11 下地作業 (内曇砥)
Shitaji process (uchigumori-to)

とが肝腎です。

このような事柄をふまえ、下地作業は錆や形の不具合を整えるための砥石から始め、最も細かい内曇砥に引き継いでいきますが、ここでの無理・無駄な作業は、天然砥・人造砥に関わらず荒い砥石ほど刀身への悪影響が強く、研師として最大の配慮が必要です。特に刀身の切先の部分は、不手際が行われやすく細心の注意が必要です。

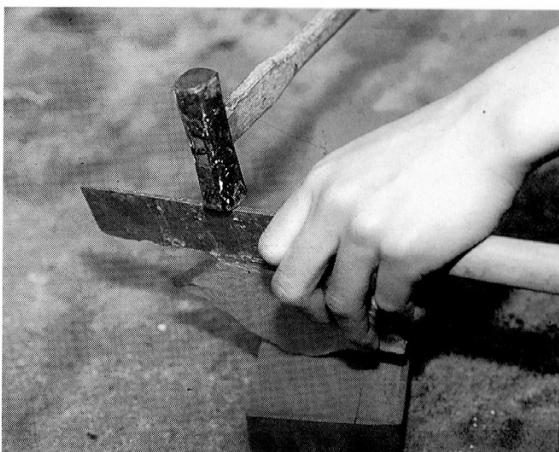
下地研ぎ 内曇砥

日本刀研磨の特質は、下地研ぎの最後にこの内曇砥を用いるところにあります。細かさと柔らかさを兼ね備えた内曇砥の性質と、この砥石に刀身が柔らかく当たるよう平らに刀身を動かし、また作業中に生じる砥汁を残しながら研磨する事で刀身が白色に仕上がります。このことによって刀身の微妙な硬軟の差を現す事が出来、日本刀の最大の特質の刃文と地肌の美しさの概要が見て取れるようになります。この時に用いる内曇砥は内曇の中でも柔らかい方の性質で刃砥 (刃引き) とも呼ばれます。この後、やや堅い性質の地砥 (地引き) を当てて肌を出しておく作業を加える場合もあります。こうして下地作業を終えたとき、砥石目は仕上りの時の砥石目と同様に、刀身の棟の線に平行になるよう整えます。ただし、鑄造りの場合の銚子と称する切先の部分は棟と直角の砥石目に整えます。

なお、この内曇砥の前の細名倉砥までは人造の砥石も使用できますが、内曇砥以降は天然砥石が必要です。硬度の高い人造砥でこれ以上の段階で進めていくと、刀身全体が鏡面のように仕上がってしまい、刃文・地肌という日本刀の特質が全く見えない状態となってしまいます。このように刀剣の研磨に肝腎な役割を果たす内曇砥も、他の天然砥同様に産出が少なくなっており、他に変わる物がない砥石であるため、良質な内曇砥の安定した供給が今後の課題です。

仕上げ研ぎの準備 艶砥造り

これまでの下地研ぎで刀剣の姿は完成し、刃文と地肌も基本的なものは見えてきますが、この刃文と



12 艶砥造り (地艶削)
Making tsuya-to (jitsuya)

地肌を一層美しく現すために仕上げ研ぎの作業に入ります。この準備段階として、仕上げ研ぎで用いる砥石を事前に作成しておきます。仕上げ研ぎで用いる砥石は、下地研ぎで用いるものと形態が異なり、薄く小さな形で用い、艶砥と呼ばれています。艶砥を造るには、まず充分選別した砥石を薄く割り、大村砥で粗めに形を整え、更に片面を青砥で細かくし、水で洗浄します。乾燥後、吉野紙等の極薄でも丈夫な楮和紙を、細かくした面に乗せ、生漆を用いて裏打ちします。漆が乾くまで二週間以上かけるため、艶砥は事前に纏めて造っておきます。艶砥は内曇砥で造ったものを刃艶、より堅い鳴滝砥で造ったものを地艶と呼びます。

なお、この艶造りの時の砥石も大村砥・青砥のような天然砥を使います。人造の砥石を用いると、これ以降の仕上げ作業中に刀身に細かなキズを生じさせてしまいます。

艶砥を、実際に仕上げ研磨に使用するには、更に薄く磨り、小刀で小さく切って使用します。厚めの時は1mm弱程、薄目の時は光に透ける程の場合もあります。大きさは大き目の時は1cm角程、小さい時は数mm角程の場合もあります。このようにして作られた艶砥を用いる作業は、刀身を片手で持ち反対側の膝に当てて固定し、もう片方の手の親指先で艶を刀身にあてて、棟に添って艶を動かして進めます。

仕上げ研ぎ 刃艶砥

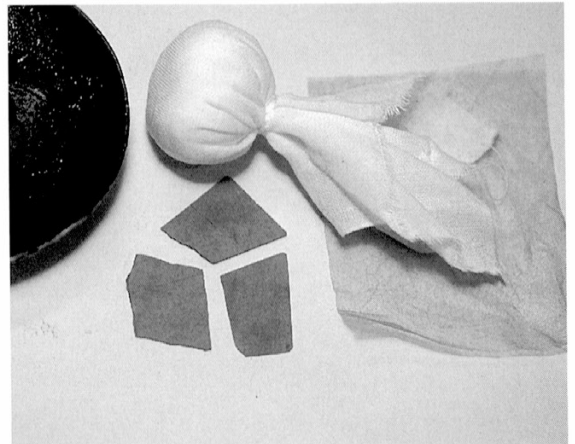
仕上げ工程の最初の刃艶砥は、下地工程の最後の内曇砥で造られています。この刃艶砥を1cm角弱程の大きさにし、割れ目を基盤の目状に加えて刀身になじむように加工し、下地作業で残った内曇砥の砥石目の小さなムラを、棟の方向に平行に整えます。研磨の進行・刀身の場所等に応じて薄い刃艶を用いるなどの配慮をします。ただし、鋸造りの銚子の部分は「なるめ」という最後の仕上げ作業で棟方向と直角の砥石目に整えるため、敢えて平行方向に整えることはいたしません。

仕上げ研ぎ 地艶砥

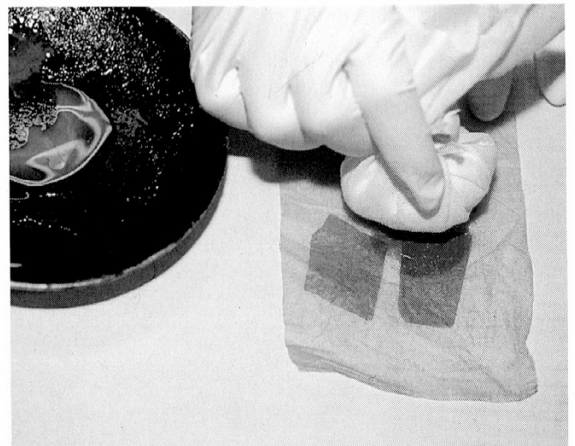
次の地艶砥の工程は地肌を美しく鮮明に現わすた



13 艶砥造り (地艶磨り)
Making *tsuya-to* (polishing with *jitsuya*)



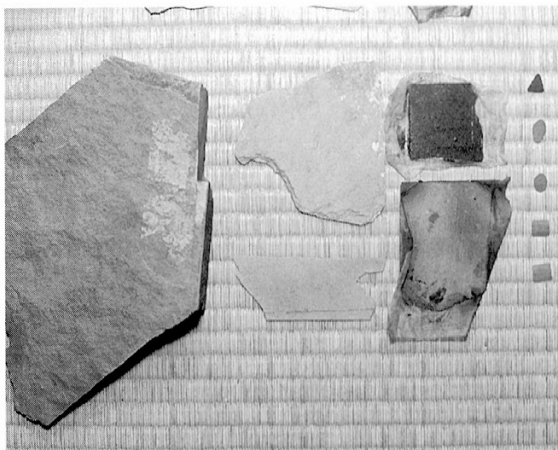
14 艶砥造り (艶張り) Making *tsuya-to*
(右から 吉野紙<柿渋引き> 綿を木綿でくるんだもの 刃艶 生うるし) (from the right: Yoshino paper coated with persimmon tannin, cotton ball wrapped in cotton cloth, *hatsuya*, raw *urushi*)



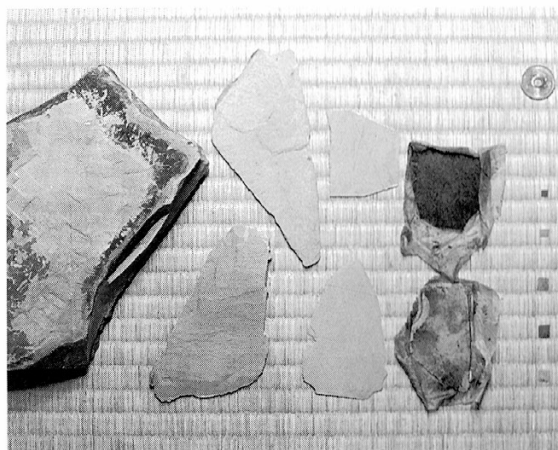
15 艶砥造り (艶張り作業)
Making *tsuya-to* (work in progress)



16 艶砥造り (作業後)
Tsuya-to completed



17 刃艶砥造り見本
Making jitsuya-to



18 地艶砥造り見本 Making jitsuya-to
(右から 実際に使う艶 吉野紙で裏打ちしたものと薄く割ったものと表面を磨いたもの コッパ<砥石>)
(from the right: tsuya actually used, that lined with Yoshino paper, that broken into thin pieces and that with its surface polished, whetstone flakes)

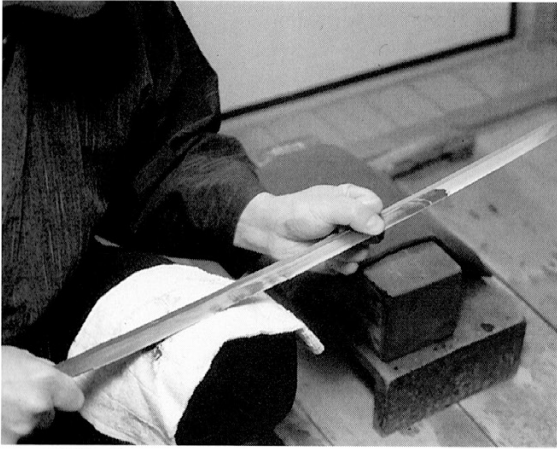
めの作業です。前の段階の刃艶砥にも硬軟の性質の差があり、刀身や作業の内容に応じて使い分けますが、地艶砥の方がこの差が大きくあり、柔らかい地艶から次第に堅い地艶へと少なくとも三段階以上の艶砥を、碁盤目状に割れ目を加え使用します。また、刀身の状況に応じて、艶の厚さ・大きさを選択し、砥汁の多少・力の入れ具合・動かし具合等々の加減で地肌の現れ方を調整して、目的の状態になるように進めていきます。

この地艶の段階で、刃文をそのままの姿で浮かび上がらせる「差し込み研ぎ」と、刃文部分を再度柔らかい刃艶砥用いて白く仕上げる「刃取り研ぎ」とで、対応に違いがはっきり出てきます。差し込み研ぎは刃文と地肌の両方を刃艶と地艶の両方を使い調整をしながら仕上げを進め、最終段階の「ぬぐい」で刃文と地肌の両方を同時に完成させねばならないのに対し、刃取り研ぎは地肌の部分を仕上げた後に刃文部分を仕上げる作業です。それぞれの研ぎの手法にあわせた艶砥にて作業を進めます。

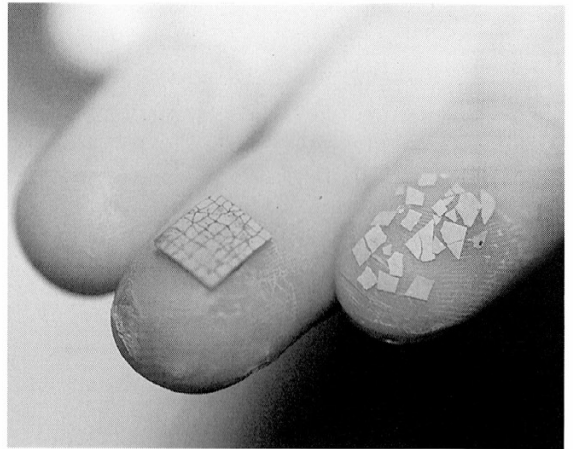
なお、地艶は楮和紙で裏打ちせずに薄片のまま小さく割ったものを用いる手法も広く行われ、「くだき地艶」と称され、裏打ちした「張り地艶」と区別をしています。どちらの手法を基本に選択するかは、研師がそれぞれ判断して選びますが、刀身に彫物があるときは張り地艶でないといふ使いにくいので、くだき地艶を通常用いる人も張り地艶を全く用いないわけではありません。

仕上げ研ぎ ぬぐい

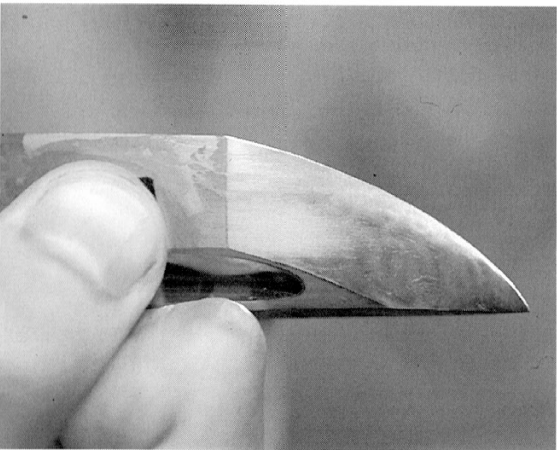
地艶を終えると、次が「ぬぐい」という工程に入ります。このぬぐいの工程はこれまでの他の工程が各々一日程から数日かかるのに対し一時間程の作業ですが、研磨の仕上がりに深い関わりを持っています。また、刀剣研磨の工程では唯一油を媒体として用いる作業で、一般的には鉄の微粉末を油で溶いたものを、綿を用いて親指で押さえながら研磨します。鉄の微粉末には磁鉄鉱を材料にする場合と、金肌という刀剣の鍛錬の過程で生じるものを材料にする場合の二つがあります。差し込み研ぎに用いる磁鉄鉱を材料にしたものは黒色で、やや柔らかかなのに



19 刃艶作業
Hatsuya process



22 地艶 (右 くだき艶 左 張り艶)
Jitsuya (right: crushed stone, left: stone sheet)



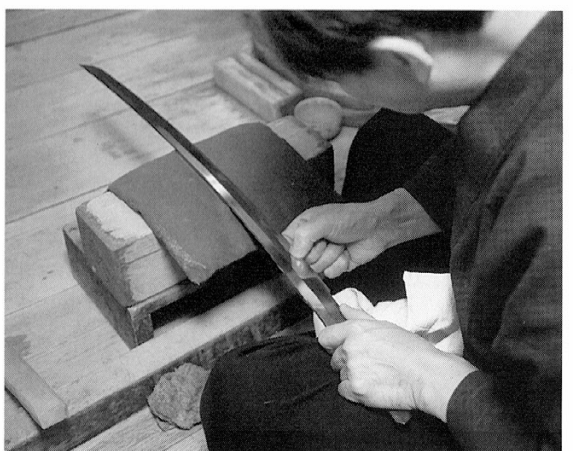
20 つや作業 (横手付近)
Shining process (around the transverse ridge)



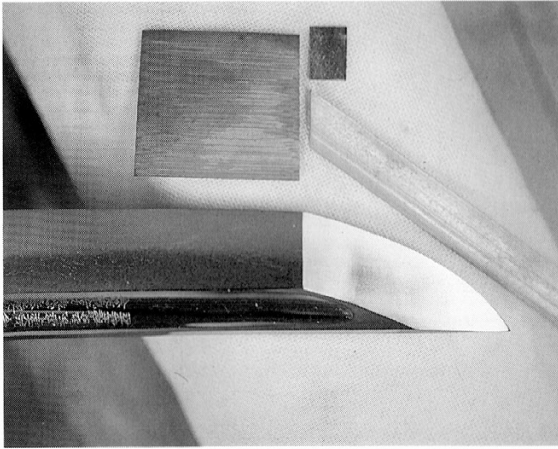
23 ぬぐい作業
Nugui process



21 地艶作業
Jitsuya process



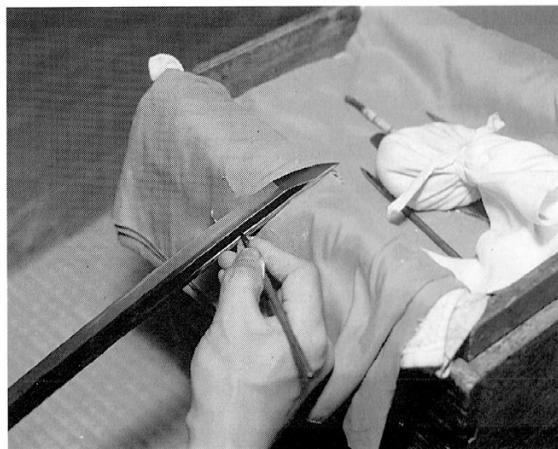
24 刃側からの刃取り
Hadori process



25 横手切り道具 (右から竹ヘラ 刃艶 定規)
刀身は横手切りを終えた状態
Tools for making the transverse ridge (from the right:
bamboo spatula, hatsuya ruler)



26 なるめ作業
Narume process



27 磨き作業 (鍋を磨き棒で磨く)
Migaki process (polishing shinogi with a polishing stick)

対し、刃取り研ぎに用いる金肌から作られたものはえんじ色をしており、やや堅いという性質があります。ぬぐい粉はそれぞれの材料を乳鉢で念入りに磨り作成します。

差し込み研ぎと刃取り研ぎ

差し込み研ぎと刃取り研ぎは地艶作業も異なりますが、基本的な差異はこのぬぐいで用いる粉末の硬軟の差異が、刃の部文に及ぼす違いといえます。差し込み研ぎに用いる磁鉄鉱の微粉末のような柔らかめのぬぐいを入れると地肌部分が地艶の段階より黒みが高くなり美観を増しますが、白ろめに仕立てておいた刃文部分はほぼそのままに仕上がりに、その結果刃文は一層浮き上がって見え、刃文の働きなどがそのまま鑑賞することができます。差し込み研ぎは刀剣の自然な素顔を見せようとする手法です。

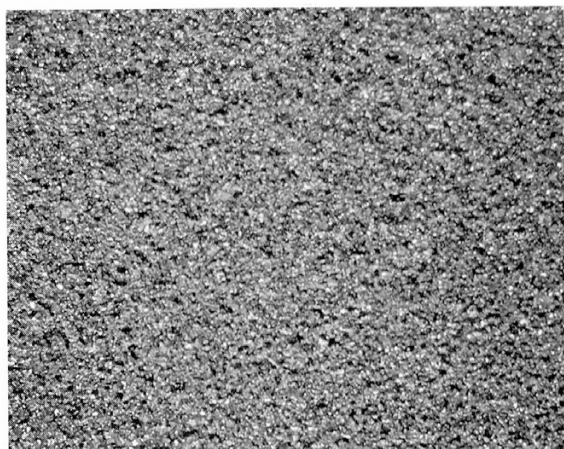
これに対し、刃取り研ぎに用いる金肌(刀匠による素延と火造りと呼ばれる刀剣の形造りの際、赤く熱せられた鋼の表面から剥離する酸化鉄の皮膜を金肌といいます。研磨に用いるには、更に長時間焼いてから、乳鉢で微粉末にすりつぶします。磁鉄鉱が黒色なのに対し、えんじ色をしています。)のような硬めのぬぐいを入れると、地肌部分が美観を増しますが、刃文部分も黒みが増してしまいます。このため、刃文部分だけを浮き立たせるために、刃取りと呼ばれる作業を行います。刃取り作業は丸みを持った刃艶砥(碁盤の目状の割れ目は加えない)を用い刃文部分を白く仕上げて行きます。刃取りを行うことによって、刃文の出来によっては幾つかの乱刃を纏めることなどで美観を増すこともでき、刃文部から少しだけ地肌部分にあてられた部分が、刀身の中で最も白く仕上げられることで華やかな印象に仕上がります。また、この最も白く仕上げられた分だけ焼巾が実際より広く感じられることで刀身の印象が高められもします。これらが、刃取り研ぎを化粧研ぎともいわれるゆえんです。

なお、この刃取り作業の姿勢は、刃側から刃艶を使う手法と、棟側から刃艶を使う手法との両方が行われています。いずれの場合でも刃艶の砥石目は短刀や薙刀の先の丸いフクラ部分も他の部分と同様に

仕上げ研ぎ なるめ

このように差し込み研ぎではぬぐいまで、刃取り研ぎでは刃取りまでを終えると、後は刀身の造り込みによって、作業が変わってきます。切先部分に銚子と呼ばれる部分のある本造り等の場合は、この銚子の部分に残っている下地研磨時の内曇砥の砥石目を刃艶で整える「なるめ」作業を行います。まず、横手の線を定めるために、柔らかく・厚めの刃艶砥を用い横手線部分を薄い竹の定規に従って、筋切り竹べらで押しえながら区切りを付けます。この作業を「横手を切る」といいます。更に、なるめ台に乗せた2cm×5cm程の刃艶砥で銚子の全体を白く整え、なるめ作業を終えます。なお、刀身の状況によっての差異がありますが、用いる刃艶砥の厚さは、刃取り作業でもなるめ作業でも、基本的にはやや厚めのものから薄い刃艶砥を用いるようにして、最も細かい砥石目に仕上げるよう作業を進めます。

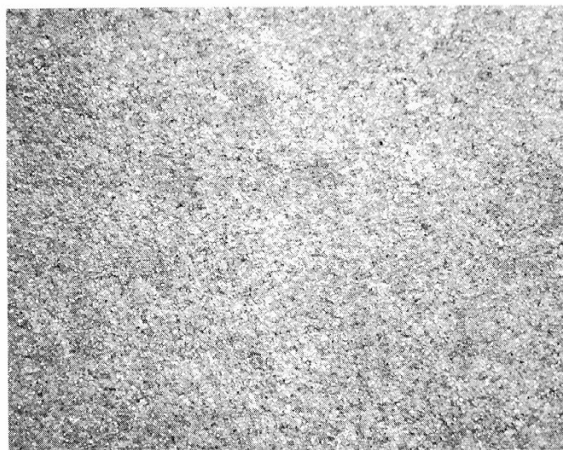
28図～40図は各3.2倍



28 人造砥石面 (荒砥)
Surface of an artificial whetstone (*ara-to*)



30 人造砥石面 (改正)
Surface of an artificial whetstone (*kaisei-to*)



29 人造砥石面 (備水)
Surface of an artificial whetstone (*binsui-to*)



31 人造砥石面 (名倉)
Surface of an artificial whetstone (*nagura-to*)

仕上げ研ぎ 磨き

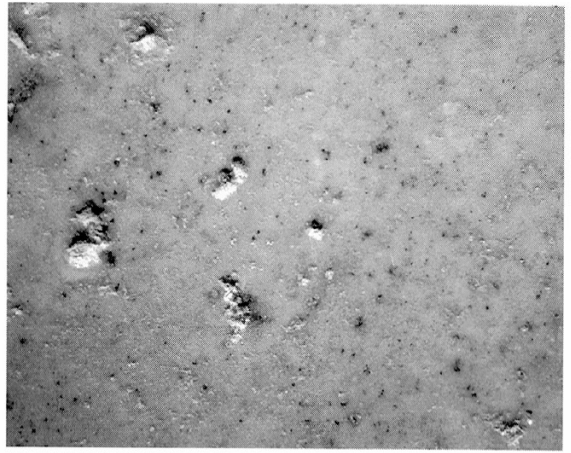
鑄造りの刀剣の場合、研磨の工程の最後に、棟と鑄を磨きへらで下磨きを行い、つぎに磨き棒で上磨きを行い、刀身中最も黒く鏡面状に仕上げます。刀身の反りの内側にある鑄の部分に黒く仕上げることで、姿が引き縮まり、地肌・刃文部を引き立たせる効果があります。磨きには焼きの入った鋼をへらや棒状に加工したものが用いられてきていますが、近年はより硬度の高い材料も用いられています。それらを砥石等を用い鏡面に近く仕上げおきます。磨き作業は、鹿の角の粉を水でといたものを用いて刀身の油分等を除去した後、「いぼた」の微粉末（いぼた粉を木綿布でくんだものを刀身に軽くたたき、でてきたもの）を刀身に薄くのせ、軽く布にてぬぐうことで磨きへらや棒が当たりがなめらかになり、むらなく鏡面に仕上げることができます。

下磨き・上磨きの作業を、どの段階で行うかは一定のものではありませんが、樋などの彫物は名倉砥を終えた段階で下磨きをしておきます。

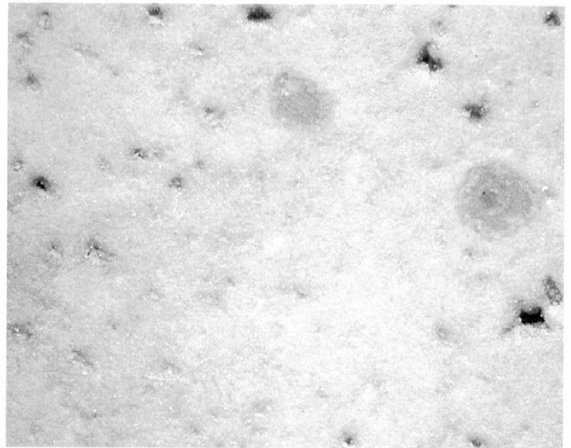
なお、彫物の錆の除去は、砥石で出来る作業は研師が分担しますが、鑿を使う作業は彫刻師或いは刀匠が分担します。彫物の磨きは彫物用の磨き棒を用います。

おわりに

以上の刀剣研磨のそれぞれの工程で要する時間は、一般的な新作刀での場合、荒砥で四～五日、備水砥で二～三日、改正砥で一～二日、名倉砥が半日、細名倉砥が半日、内曇砥が二日、刃艶砥は半日弱、地艶砥は三～四日、ぬぐいは一時間、刃取り一日～四日、なるめ一日、磨き一日を目安としています。また、脇指や短刀の作業時間でも、刀身の切先部分の作業に時間を要するため、長さの比以上の時間を要します。なお、研磨の手法は、研師の独自の工夫による細かな差が数多くありますが、これまで述べた基本的なことの理解のために36頁のような一覧表を作りました。



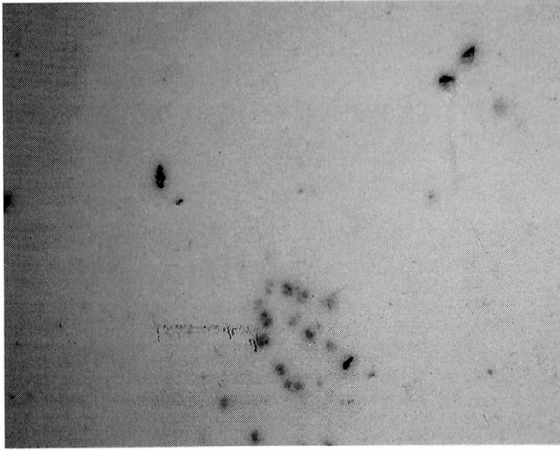
32 天然砥石面（伊予砥）
Surface of a natural whetstone (*iyō-to*)



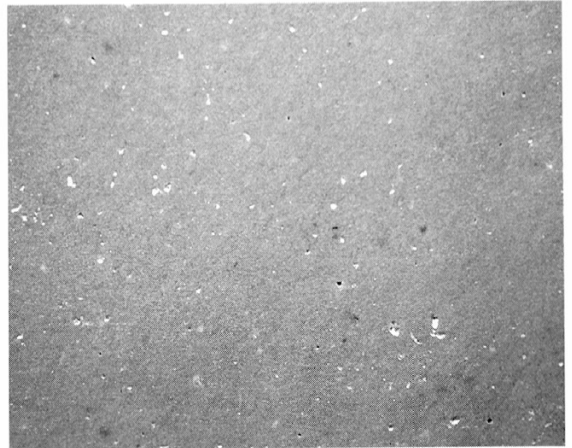
33 天然砥石面（備水）
Surface of a natural whetstone (*binsui-to*)



34 天然砥石面（改正砥）
Surface of a natural whetstone (*kaisei-to*)



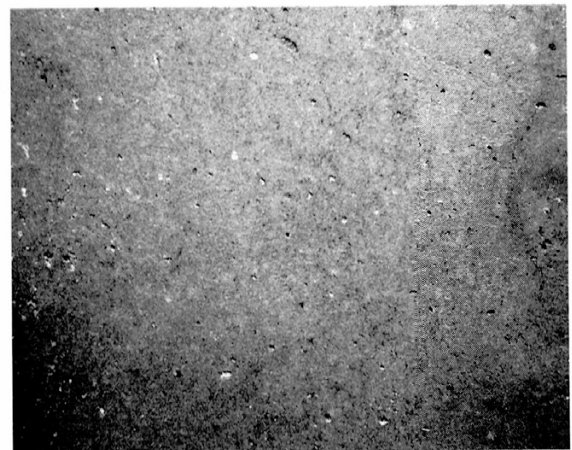
35 天然砥石面 (名倉砥)
Surface of a natural whetstone (*nagura-to*)



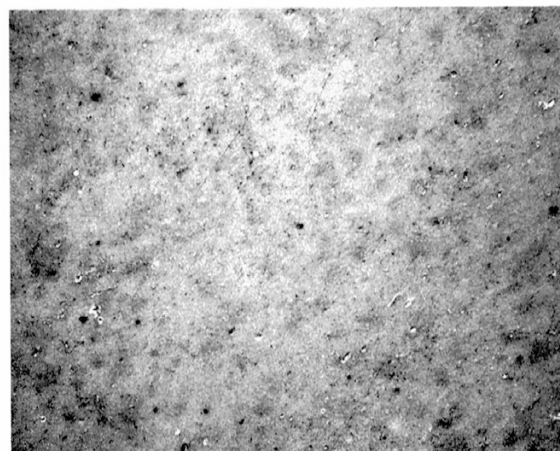
38 天然砥石面 (地砥)
Surface of a natural whetstone (*ji-to*)



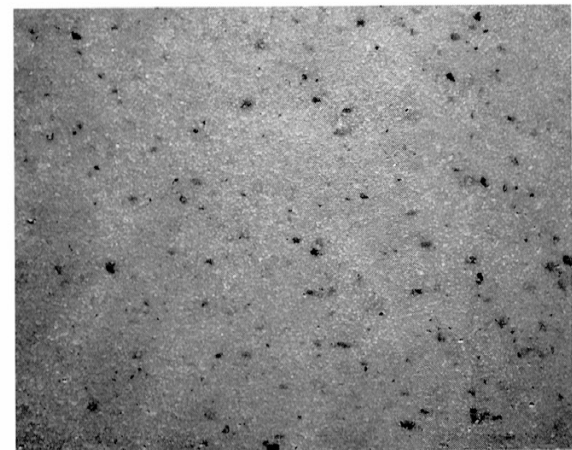
36 天然砥石面 (細名倉)
Surface of a natural whetstone (*koma-nagura-to*)



39 天然砥石面 (刀艶)
Surface of a natural whetstone (*hatsuya*)



37 天然砥石面 (刃砥)
Surface of a natural whetstone (*ha-to*)



40 天然砥石面 (地艶)
Surface of a natural whetstone (*jitsuya*)

On the Technique of Polishing Japanese Swords

FUJISHIRO Okisato

Introduction

The process of polishing Japanese swords (*kenma* in Japanese) can be divided into two major processes: *shitaji togi* (first phase) and *shiage togi* (second phase). The aim of the former is to complete the structural characteristics of the sword; that of the latter is to bring out the beauty of the *hamon* (patterns along the sharp edge) and *jihada* (blade surface texture). There are also two techniques in the second phase: *sashikomi togi* and *hadori togi*. *Sashikomi togi* was used in polishing all the swords in this restoration project. In this report, the author will explain this technique, including its merits, and will compare it with *hadori togi* which is used commonly today.

Before starting the actual work of polishing a sword, it is necessary to observe the depths and shape of the rust and the presence of forging defects on the blade so as to determine the fundamental policy for polishing. Depending on the condition of chipping or the size of the rust, they may be left as they are on purpose. At times, polishing may even not be done or only parts may be polished. The *nakago* (tang) of the blade, however, is never polished since the old rust on this part is considered to be original and thus valuable.

Shitaji togi: Ara-to to Koma-nagura-to

The first whetstone to be used in *shitaji togi* is selected according to the depth and shape of the rust. Generally, *ara-to* like *matsumura-to* and *sasaguchi-to* are used for swords that have been newly made or for old swords that have very deep rust. *Binsui-to* and *iyō-to* are used for old swords with deep rust or for swords whose surface are uneven; *kaisei-to* is used when the rust is a little deep or when there is a certain degree of unevenness. *Nagura-to* and *koma-nagura-to* are used when the rust is shallow or when there is not much unevenness. It is very difficult to remove rust or unevenness with *uchigumori-to*, but it is possible to remove small rust or unevenness on the blade point or other rounded parts of a sword. Of course, the hardness of the blade also plays a part in selecting the type of whetstone. Since the rust on the swords that were restored in this project was not particularly deep, *ara-to* was not used; instead, polishing started with *binsui-to*.

To actually polish a sword in the *shitaji togi* process, we hold the blade with both hands and move it on a whetstone that is stabilized. At this time, the left hand is bare while the right hand is wrapped with a cloth so as to hold the blade firmly. By placing the underarm on top of the right knee we can control the movement of the arm.

We move the blade back and forth when using *ara-to*, *binsui-to* or *kaisei-to*. In the case of *ara-to*, the grain on the whetstone (*toishi-me*) is held almost perpendicular to the back of

the blade, while with *binsui-to* and *kaisei-to* the grain is gradually inclined to erase the grain of the previous whetstone. With a *nagura-to*, the blade is moved to the right and left so that the grain of the whetstone is parallel to the back of the blade. In this case, the grain of the whetstone is adjusted by adding a slightly scooping movement. Then we move on to *koma-nagura-to*. Sometimes changing the direction of the grain of the whetstone from perpendicular to parallel is done with *kaisei-to*. Also, since there are some differences in the size of the particles of the whetstone for each step, sometimes one step may be skipped. For example, if a slightly finer *nagura-to* is used, then we may skip *koma-nagura-to* and proceed directly to *uchigumori-to*.

In this way, in *shitaji togi* we start with an *ara-to* and proceed to the finest *uchigumori-to* in order to adjust any unevenness. We need to be careful at this stage because any forced or unwanted action will have a great negative influence on the blade, and this influence will be greater when the whetstone is coarser. Mistreatment is more likely to occur especially at the tip of the blade, so extra care must be taken. With regard to the surface of the blade, *shinogi* (longitudinal ridge) is made straight, while other parts are adjusted so that the edge of the blade would have a slightly stronger rounder effect.

Recently it has become difficult to find natural whetstones of good quality. On the other hand, the quality of artificial whetstones has improved gradually and the unevenness of the size of the particles sometimes seen on natural whetstone is rarely found so that it is now possible to obtain ones sufficiently suitable for use as a polishing material. The size of the particles of artificial whetstone corresponds as follows to the names of natural whetstone: *ara-to* – #120 - 220, *binsui-to* – #400, *kaisei-to* – #600, *nagura-to* – #800, and *koma-nagura-to* – #1500 - 2000, approximately. However, since small scratches may be made if the finishing work is done at a worksite where artificial whetstone has been used, it is advisable to separate the worksites.

Shitaji togi: Uchigumori-to

The special feature of the technique of polishing Japanese swords lies in the use of *uchigumori-to* at the final stage of *shitaji togi*. The characteristics of this whetstone are its fine particles and soft texture. By moving the blade flat so that the blade will come in contact softly with the whetstone and by not throwing away the whetting water that is produced in the process, the blade will be polished white. In this way it becomes possible to display the subtle differences in the softness and hardness of the blade, thus highlighting the beauty of the *hamon* and of the *jihada*, which is the greatest characteristic of Japanese swords. The *uchigumori-to* used at this point is either soft or hard. When the *shitaji togi* process has finished, the grain of the whetstone is adjusted so that it becomes parallel with the line of the back of the blade, as it is done with the grain of the whetstone in the finishing process. However, if there is *shinogi*, then the part of the tip of the blade called “*boshi*” is adjusted so that the back of the blade and the grain of the whetstone are perpendicular.

It is possible to use artificial whetstone until the step in which *koma-nagura-to* is used, just prior to this step, but natural whetstone must be used after this step. If artificial whetstone which is harder is used, the entire blade will be finished like the surface of a mirror and it will not be possible to see the *hamon* and *jihada*, which are characteristic of Japanese swords. However, since, as with other types of natural whetstone, it is also becoming more difficult to obtain *uchigumori-to*, which has a crucial role to play in the polishing of Japanese swords, and since there is no other whetstone that can replace it, stable procurement of good quality *uchigumori-to* is an issue to be dealt with.

Preparations for *Shiage togi*: Making *Tsuya-to*

Shitaji togi having been completed, the appearance of the sword is completed and the basic patterns of the *hamon* and the *jihada* become visible. We then proceed to *shiage togi* in order to display these patterns all the more beautifully. As a preparation, we first make the whetstone that will be used in this process. The configuration of the whetstone used for *shiage togi* is different from that used for *shitaji togi*. It is thinner and smaller and is called "*tsuya-to*." To make *tsuya-to*, a carefully selected whetstone is peeled thinly and roughly shape formed with *omura-to*. It is then made thin with *ao-to* and cleaned with water. After it has dried, it is lined with strong *kozo* paper using raw *urushi* lacquer. Since it takes over two weeks for *urushi* to dry, *tsuya-to* must be made ahead of time. *Tsuya-to* made from *uchigumori-to* is called "*hatsuya-to*" while that made from a harder type of whetstone known as *narutaki-to* is called "*jitsuya-to*." Natural whetstone like *omura-to* and *ao-to* are used in making *tsuya-to*. If artificial whetstone is used, it will cause minute scratches on the blade during the work of *shiage togi* that will follow.

In order to actually use *tsuya-to* in *shiage togi*, it is made still thinner and cut into smaller pieces with a small knife. If it is a bit thick, it may be made a little thinner than 1mm; if it is thin, it may be made so thin as to become translucent. The size of the *tsuya-to* may be as large as 1cm³ or as small as several mm³. In using this *tsuya-to*, we hold the blade with one hand and stabilize the blade by holding it against the knee of the other side of the body. We press the whetstone against the blade with the thumb of the other hand and move the whetstone along the back of the blade.

Shiage togi: *Hatsuya-to*

The first *hatsuya-to* to be used in the *shiage togi* process is made from the *uchigumori-to* that was used in the last step of *shitaji togi*. This *hatsuya-to* is made into a size of about 1cm³ and then glued onto Japanese paper with *urushi*. It is used to adjust the small unevenness of the grain of the whetstone which was left by *uchigumori-to* so that it will become parallel with the direction of the back of the blade. *Hatsuya-to* of different thickness is used, depending on the progress of the polishing process and the place on the blade that is being polished. However, because the *boshi* in a *shinogi-zukuri* style is adjusted at the last step of

shiage togi called “*narume*” so that the grain of the whetstone becomes perpendicular to the direction of the back of the blade, there is no need to make the grain parallel at this stage.

Shiage togi: Jitsuya-to

The purpose of the next step, that of whetting with *jitsuya-to*, is to make the *jihada* finer and clearer. There is difference in the hardness of the *hatsuya-to* used in the previous step, and *hatsuya-to* of different hardness is used according to blade and content of work, but such difference is greater with *jitsuya-to*. There are at least more than three levels of hardness in *jitsuya-to*, starting from a softer one and proceeding to a harder one. These levels of *tsuya-to* are used accordingly, with the pieces of whetstone glued onto Japanese paper with *urushi*. Moreover, the thickness and the size of the whetstone are selected according to the condition of the blade. The amount of water used, the amount of pressure applied and the direction of the movement are adjusted in order to bring out the *jihada* to desire.

At this point of *shiage togi*, distinctions are made so as to bring out the *hamon* as it is (*sashikomi togi*) or to use soft *hatsuya-to* again on that pattern to give it a white finish (*hadori togi*). For the former, both the *hamon* and *jihada* are adjusted and finished by using both *hatsuya-to* and *jitsuya-to* so that both may be finished simultaneously in the last step of *nugui*. On the other hand, in the latter, the *jihada* is finished first, after which the *hamon* is finished. *Jitsuya-to* suitable for each method of polishing is used.

A technique of whetting with *jitsuya-to* called “*kudaki jitsuya*” is also used frequently. In this technique, the *jitsuya-to* is not lined with *kozo* paper; plain thin fragment of whetstone is used, instead. When the whetstone is lined, it is called “*hari jitsuya-to*.” The polisher makes the decision as to which technique will be selected basically. If there are carvings on the blade, the latter is easier to use. So even those who normally use the former will sometimes use the latter.

Shiage togi: Nugui

Once *jitsuya-to* is finished, we proceed to the step called *nugui*. Each of the steps taken until now takes one to several days, but this step requires only an hour or so. However, this step is closely connected with the finish of the polishing. It is also the only step in polishing a sword in which oil is used as a catalyst. Normally, fine iron powder mixed with oil is used with cotton cloth. The blade is polished with the thumb. Either magnetite or *kanahada*, which is made during the process of tempering a sword, may be used as iron powder. While iron powder made from magnetite used in *sashikomi togi* is black and somewhat soft, that made from the *kanahada* used in *hadori togi* is dark red and somewhat hard. *Nugui* powder is made by carefully grinding the iron powder in an unglazed bowl.

Sashikomi togi and Hadori togi

Although the *jitsuya-to* work of *sashikomi togi* differs from that of *hadori togi*, the basic difference between the two lies in the difference that the hardness of the powder used in *nugui* has upon the *hamon*. If a soft type of magnetic iron powder like that used in *sashikomi togi* is used for *nugui*, the *jihada* becomes darker than it was at the previous step of *jitsuya*, thus resulting in greater beauty, while the *hamon*, which has been finished somewhat white, remains that way. The overall result, then, is that the *hamon* becomes all the more evident, making it possible to appreciate the workings of the *hamon*. In other words, *sashikomi togi* is a technique that seeks to bring out the natural appearance of the sword.

On the other hand, if a hard *kanahada* (iron oxide film that is peeled off from the surface of red hot copper during the process of tempering a sword; it is further treated for several hours and grinded in an unglazed bowl into very fine powder; while iron powder made from magnetite is black, *kanahada* is dark red.) like that used in *hadori togi* is used for *nugui*, the *jihada* increases in beauty but the *hamon* also increases in darkness. As a result, in order to make the *hamon* more evident *hadori* is done. In *hadori* work, a rounded *hatsuya-to* is used to give a white finish to the *hamon*. By doing so, it is possible to increase the beauty of the *hamon* by polishing several patterns together, depending on the condition of the *hamon*. As a result, the border between the *hamon* and the *jihada* becomes white and the overall impression very attractive. This is the reason for calling *hadori togi* “*kesho togi*” (cosmetic finish).

It is possible to do *hadori togi* from the side of the blade or from the back of the blade. In either case, the grain of the *hatsuya-to* is adjusted so that the round edge curve of a short blade or of a halberd becomes parallel with the back of the blade, as with other parts.

The polisher is able to express his uniqueness in the way he finishes the decorative *hamon* during *hadori* work. It is also a chance for him to exhibit his skill. However, it is also true that the original *hamon* becomes difficult to see, and there is a risk that a person who sees a sword for the first time may mistake the shape of *hadori* that has been applied by the polisher for the *hamon*. However, there is less risk of unevenness if *kanahada nugui* is used in *hadori togi* at places where the steel texture is not strong or where there are carvings. The technique of *hadori togi* is said to have started from the end of the 19th century and is favored for its attractiveness. Most swords today are finished with *hadori togi*.

Sashikomi togi is most suitable for irregular *hamon* that are clear and large. Examples of such patterns are found in Bizen and Mino schools of the 16th century and swords made by Koyama Munetsugu and others during the 19th century. However, there are more cases today in which such swords are also made by *hadori togi*. On the other hand, there are many modern swords that are made to appear whiter by using *hadori* polishing. But recently the merits of traditional *sashikomi togi* are recognized. By having these swords exhibited, people have come to find the merits of *sashikomi togi* which is suitable for exhibition within a glass case.

Shiage togi: Narume

After *nugui* is completed in *sashikomi togi* and *hadori* is completed in *hadori togi*, the work differs according to the way the blade is made. In the case of a *honzukui* style where there is a part called “*boshi*” on the point of the blade, *narume* is done on this part. *Narume* is a step in which the grain of the whetstone used in the *uchigumori* stage of *shitaji togi* that is found remaining on the *boshi* is adjusted with *hatsuya-to*. First, in order to determine the dividing line between the surface of the blade and the point, a soft, thick *hatsuya-to* is used to mark a line with a thin bamboo ruler and a special bamboo spatula. This step is called “*yokotewo kiru*” (literally, cutting the dividing line). Then the entire *boshi* is adjusted white with a *hatsuya-to* of about 2cm x 5cm which is place on a *narume* stand. Although the thickness of the *hatsuya-to* used in *hadori* and *narume* works differs depending on the condition of the blade, basically a slightly thicker one is used at first, then proceeding to a thinner one.

Shiage togi: Final Polish

In the case of a *shinogi-zukuri* sword, the back of the blade and the *shinogi* is first polished with an iron spatula. Then they are further polished with a polishing stick to give it a darkest and mirror-like appearance. By making the part of the *shinogi* which is found on the inner side of the blade curvature dark, the *jihada* and the *hamon* become more evident. Tempered steel made into the shape of a spatula or a stick is used to do the polish, but recently some harder material is also used. These tools are first polished like a mirror by using a whetstone. Next, powdered deer antler mixed in water is used to remove oily substances from the blade. Then fine insect wax powder, which is made by wrapping *ibota* insects in a cotton cloth and lightly pounding it with a blade, is placed thinly on the blade. This powder is then lightly wiped with a cloth so that the spatula or the stick will come into smooth contact enabling a smooth mirror-like finish.

There is no set rule as to when to do the first and the second final polish, but for the parts of the sword like the *hi* grooves they are done after whetting the sword with *nagura-to*.

To remove rust from carved parts of the swords, the polisher takes care of that part of the work which can be done with a whetstone, but the work which uses a file is done by a carver or a sword smith. A special stick is used to polish the carved parts of swords.

Conclusion

Approximate time required for each step of the polishing process for Japanese swords are as follows for a newly made sword: 4-5 days for whetting with *ara-to*, 2-3 days with *binsui-to*, 1-2 days with *kaisei-to*, half a day with *nagura-to*, half a day with *koma-nagura-to*, 2 days with *uchigumori-to*, a little less than half a day with *hatsuya-to*, 3-4 days with *jitsuya-to*, 1 hour for *nugui*, 1-4 days for *hadori*, 1 day for *narume* and 1 day for polishing. For polishing short swords and short blades (daggers), the time required does not depend on

the length since it takes time to work on the point of the blade. There are also many subtle differences in the process of polishing, depending on the individual polisher. A table is provided below to explain the basic points mentioned above.

Before polishing

Basic policy regarding polishing, including whether a sword will be polished or not, is determined, taking into careful consideration the condition of the sword such as the existence of rust and weak portions.

Polishing processes

1. *Shitaji togi*

<i>Ara-to</i>	The choice of whetstone depends on the condition of the rust, presence or absence of chipping and other factors. The direction in which the whetstone is applied (grain of the whetstone) is called “ <i>kiri</i> ” in the case of <i>ara-to</i> . The whetstone is applied perpendicular to the back of the blade. This direction is gradually inclined, starting with <i>binsui</i> , until it becomes parallel to the back of the blade with <i>nagura</i> .
<i>Binsui-to</i>	
<i>Kaisei-to</i>	
<i>Nagura-to</i>	
<i>Koma-nagura-to</i>	

Uchigumori-to

Hato (soft): Soft *uchigumori-to* is positioned so that the texture appears. As a result, the outlines of the *hamon* and *jihada* become clear.

Jito (hard): Usually not used in the case of *sashikomi togi* because the blade becomes dark.

A harder type of *uchigumori-to* is used in the case of *hadori togi* (cosmetic polishing) when one wants to bring out the texture more.

2. *Shiage togi*

Hatsuya-to: *Uchigumori-to* lined with paper is used to adjust the grain of the *uchigumori-to* in *shitaji togi* so that it will become evenly parallel to the direction of the back of the blade. In the case of *sashikomi togi*, this is done extra carefully.

Jitsuya-to: In the case of *sashikomi togi*, *narutaki-to* lined with paper is used, making sure that the *hamon* portion does not become dark. If this portion becomes dark, it is re-polished with *hatsuya-to* and made white.

In the case of *hadori togi*, *narutaki-to* lined with paper is used to bring out the *jihada*. It does not matter even if the *hamon* portion becomes dark: concentrate only on the *jihada* portion.

Nugui: Method — Iron oxide is carefully grinded in an unglazed bowl until it becomes fine powder and dissolved in oil. It is then placed on the blade. The sword is polished by pressing down the above on the blade with the thumb and using cotton.

Materials — In the case of *sashikomi togi*, finely powdered magnetite (less hard than *kanahada*) is used.

In the case of *hadori togi*, powdered *kanahada* which is produced in the process of tempering swords is used.

Hadori: Not done in the case of *sashikomi togi*

In the case of *hadori togi*, *hatsuya-to* is used to make the hamon portion white and clear.

Narume: *Hatsuya-to* is used to finish the *boshi* white.

Migaki: *Shinogi-ji* and *mune* are polished and finished like a mirror with a polishing stick and spatula.

Finishing the *hamon* and *jihada*

In the case of *sashikomi togi*, *narutaki-to* lined with paper is used to adjust the *hamon* and *jihada*. By doing *nugui*, *hamon* and *jihada* are completed at the same time.

In the case of *hadori togi*, *jitsuya-to* is used to adjust the *jihada*, which is then finished by the *nugui* process. Then *hadori* is done with *hatsuya-to* to finish the *hamon* portion.

Appreciation during exhibition

In the case of *sashikomi togi*, it is easy to appreciate swords that are exhibited inside glass cases because the *hamon* appears very clearly.

In the case of *hadori togi*, it is difficult to appreciate swords that are exhibited inside glass cases because the shape of *hamon* is adjusted by *hadori*. There is no problem appreciating swords directly.

Finish

Overall impression

In the case of *sashikomi togi*, the impression is very natural.

In the case of *hadori togi*, the impression is very splendid.

Beauty of the *hamon*

In the case of *sashikomi togi*, the beauty of the *hamon* appears as it is.

In the case of *hadori togi*, the *hamon* becomes somewhat hidden because of *hadori*.

Faults of the *hamon* and *jihada*

In the case of *sashikomi togi*, faults are very evident.

In the case of *hadori togi*, faults are not so evident.