

# A Step by Step Guide to Sogata

A Product of the National Casting Center at Alfred University

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## Introduction

Sogata is a process originating in Japan to make cast metal vessels used traditionally in tea ceremonies. The process uses common materials and is almost completely renewable, save for the fuel costs of firing and obtaining molten metal. This guide will attempt to provide a simple step-by-step process accompanied by explanations and pictures to facilitate understanding of the process, arming the reader to continue to develop the Sogata process new and exciting ways.

Below are some links to videos to give you the gist of what is entailed in sogata.

[http://www.youtube.com/watch?v=09rqepXK\\_ys](http://www.youtube.com/watch?v=09rqepXK_ys)

<http://www.youtube.com/watch?v=m5yGoWHRGoU>

## BASICS

### The Flask



The flask is what will hold the clay mold in place while it is formed into the shape of the vessel. Because these flasks will get banged around and also be exposed to high temperatures, they should be made from strong and thermally resistant materials. A simple solution is cheap, fired clay (Terra Cotta). A more thorough (and expensive) option would be a metal flask, which is normally used in production. The opening in the bottom shown above is to allow room for the sprue or vent. One sogata vessel will require two flasks, so the height of the flasks will determine where the mold line will be. Consider this when designing your form. It is common to have several flask pairs of various sizes and dimensions so that you have a wide variety of vessel types.

### The Sweep



The primary tool for creating the form of the vessel is the sweep, or cross-section of the finished vessel. The sweep can be made from any durable material, but is commonly

made from wood or metal. Wooden sweeps have the advantage of being easily formed into the desired shape by hand with common tools and can also be made into very intricate shapes using computer controlled methods, such as laser cutting. They are, however, less durable than metal sweeps and tend to degrade over time because of the presence of moisture during the molding process. This can be partially averted by reinforcing the sweep with metal.

Metal sweeps are very durable, but require more rigorous tooling to be able to form into the desired shape. This can be offset by selecting thin sheets of steel that can be easily shaped with shears and hand files. Ultimately, whether the sweep is made of wood, metal, some combination, or of other more exotic materials like acrylic, is up to the personal preference of the artist.

When designing a sweep, there are some basic elements that must be included. The sweep should have a spine that will form the center of rotation for the form. This spine will also be the pouring sprue for the sogata and so it should be dimensioned accordingly.

The sweep must also have a handle that extends beyond the flask so that you may rotate it with your hands. This handle should have a kink in it close to the form that will create the mold key for the sogata. The handle should be just over (1/2") the height of the flask, just enough room for some clay to be packed underneath. The handle also divides the top and bottom of the sweep, which are both used to create the halves of the sogata vessel.

When designing a sweep, be certain that it's roughly draftable so that it may be removed from the mold. However, only the halves have to be draftable, rather than the whole sweep and so the positioning of the handle is important.

Finally, the edge of the sweep should have a bevel on it. This will help compact the clay particles onto the mold wall as the sweep is rotated.

## Uma



Uma is Japanese for “horse”, and it is what holds the sweep upright as it’s rotated. There is no defined shape for the Uma, but it must be able to hold the sweep on its axis while it is rotated around. This can be as simple as a steel plate with a hole in it held over the sweep by a wooden apparatus. The Uma should be designed in a fashion that is convenient for you. An example is shown above.

## Tsuchi

Tsuchi means “earth” in Japanese, and is the mixture that forms the clay mold of the sogata. Tsuchi is a mixture of crushed clay particles (grog), fire clay, and water. It is prepared in several consistencies varying in smoothness for the different layers of the clay mold. The layers of the clay mold are the coarse, medium, and fine layers. The recipe for each is listed below.

### **Coarse**

*10% Fire Clay Slip*

*90% Coarse Grog (#20-30 sieve)*

*Add water until mixture can pack together. Should be able to hold its form. Add more grog if too fluid.*

### **Medium**

*15% Fire Clay Slip*

*85% Medium Grog (#60-70 sieve)*

*Add water until mixture can pack together. Should be able to hold its form. Add more grog if too fluid.*

### **Fine**

*20% Fire Clay Slip*

*80% Fine Grog (#150 sieve)*

*Add water until mixture can pack together. Should be able to hold its form. Add more grog if too fluid.*

Grog can be easily prepared by crushing fired clay with a sledge hammer, and then using the appropriate sieve to get the right particle size distribution. In general, more coarse tsuchi is needed than the medium and fine tsuchi, since it forms the bulk of the clay mold.

## **Materials**

The following is a list of materials that will be useful to you during this process. This list assumes you have the basic materials explained above.

- Several large mixing bowls
- Some small, smooth sponges
- A small bowl of water to wash your hands

- Some small sheets of plastic large enough to cover the mixing bowls and your flask. Trashbags work great.
- A spray bottle for water
- Some graphite slip (graphite powder and water)
- Some small, smooth brushes
- A roll of chicken wire
- A sack of charcoal
- A torch of some kind (low temp, something like propane)
- Plasticene
- Sand for making cores
- Baby powder
- Core paste (sand mold glue)

### **Step by Step**

The following is an extensive step by step of how to make a sogata vessel from start to finish, assuming you already have the basics explained above. This process can take anywhere from several days to weeks, depending on the complexity of the vessel and experience of the artist, so set up in a comfortable location where your work wont be disturbed.

- Set flask on a baseboard of some kind. Wood works great.
- Set up Uma and sweep so that the sweep's axis is directly in the center of flask. The sweep should be able to rotate freely. Use a level to be certain that the sweep is perpendicular to the working surface. This setup should be secured in some way so that it wont be moved or thrown off center easily. You should also be able to remove and replace the sweep easily and have it be in the same position. Careful planning and setup will make this process quick.
- Prepare a portion of coarse tsuchi. Pack this tsuchi uniformly around the flask until it is approx. 1" from the sweep at all points. Rotate the sweep to ensure that no tsuchi is built up too much. Smooth out this layer with a wet sponge.

NOTE: It is important that the tsuchi remain moist during the mold making process. If you are pulled away from your work for a long period of time, use a spray bottle to moisten the tsuchi before covering it with plastic. Also, assuming there's a small space between your handle and the top of your flask. It is recommended that you attempt to do the molding process in one session to prevent flaws in the final mold due to drying.



- Prepare a portion of medium tsuchi. Pack this tsuchi uniformly over the coarse layer until there is only approx.  $\frac{1}{4}$ " distance between the tsuchi and sweep at all points. Smooth this layer out with a wet sponge.
- Prepare a portion of fine tsuchi. Pack this tsuchi uniformly over the medium layer until it comes in direct contact with the sweep. Rotate the sweep while packing the tsuchi to ensure a good and clean surface. Clean the sweep with a sponge frequently during this stage as excessive tsuchi has a tendency to disrupt the surface. This step of the process requires a careful touch to give a smooth surface. It didn't matter so much in the steps prior, but be certain that you rotate the sweep in the direction of the bevel on its edge so that you get a fine surface.



- Place down a thin layer of graphite slip and rotate the sweep to spread it evenly across the surface. This will be your finished surface, so keep your sweep clean to give the best surface. In addition, when removing the sweep you will often get a small ridge where the sweep last contacted the mold. With practice and the

right about of moisture, you can get this ridge to not be present in the finished surface.

- Put this flask aside and repeat the previous steps for the other side of the sweep. Allow the flask to dry thoroughly, but slowly. If cracks develop, you can use the sweep to apply more fine tsuchi and graphite, or simply paint graphite slip over them. When the second flask is completed, allow both flasks to dry before continuing on.
- Prepare a small basket of chicken wire and suspend it over your flask with a small rod of some kind. Place lit charcoal in the basket, being certain that the basket does not contact the clay surface. This is to dry the surface even further.



- To finish the drying process, wrap some chicken wire around each flask so that the top of the chicken wire is about 1' from the top of the flask. Place lit charcoal directly into the flask, and pile unlit charcoal on top until the chicken wire tower is completely filled. Allow to dry thoroughly.



- Remove chicken wire and charcoal from flask. Brush the flask clean of dust. If cracks have developed during drying, brush fire clay slip (fire clay and water) over the cracks and allow to dry.



- Prepare sheets of  $\frac{1}{4}$ " thick plasticene and carefully line on the inside of the flask evenly. If you haven't before, you now must decide which half of the sogata is the top and which is the bottom. The flask that is the "top", cover the hole left by the spine of the sweep with the plasticene when you are applying it. On the

“bottom”, preserve the hole left by the spine. Shake a layer of baby powder over the inside of the flasks so that the plasticene can be easily removed later.

- Now pack a sand core in both the top and bottom flasks. In the bottom flask, the sand should be packed all the way through the hole to the bottom of the flask. This is called the core print. This will serve as a vent for gases to escape from and to keep the core in place.



- After the sand cores have set, remove them and the plasticene from the mold. Glue the two core halves together with core paste and allow to set. While the core paste is setting, apply mold wash to the core surface. Afterwards, place carefully inside the bottom flask. Place some chaplets (small pieces of metal of whatever it is you're casting) on top of the core and place the top flask over the bottom upside down. Make sure that the chaplets are providing some room for metal to flow and that the flasks meet neatly.





- Build a small cup on top of the flask stack out of the medium tsuchi. Build a layer of medium tsuchi around the seam between the flasks. Allow these both to dry.

- Place down some pit sand on whatever surface you're pouring on. Place down the flasks over it and weigh down the top flask with weights (ingots work).



- Pour away!!



- After mold has cooled, carefully remove clay mold. If metal has spilled over onto the flask directly, cut this off until it is only over the clay mold. Be careful not to damage the flask. Clean clay from mold and flask. Save the clay, as it can be used for grog in later castings.