

Design Course

## Clay Pottery

Craft of Pot-Making  
by  
Sakshi Gambhir  
IDC, IIT Bombay



Source:

<http://dsoucre.in/course/clay-pottery>

1. Introduction
2. Traditional Potters
3. Clay
4. Hand-Building
5. Throwing
6. Trimming & Fluting
7. Bisque Firing
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### Introduction

Pot-making has a language that is beyond the grammar of written words. It is like a conversation that happens between clay and fingers, the former almost commanding the latter how to move in a certain rhythm and create the form. Clay is, at the same time challenging yet simple, primordial yet playful, formless but creates the form and most importantly, it is full of surprises. In it one can feel seeds of growth that can be nurtured with the hands. Pots are like babies - a projection of the potter who makes them.

As Soetsu Yanagi rightly puts it - "There is something so basic, so natural in the hand that the urge to utilize its power will always make itself felt. Moreover, the chief characteristic of handcrafts is that they maintain by their very nature a direct link with the human heart, so that the work always partakes of a human quality."

Source:

<http://dsoucre.in/course/clay-pottery/introduction>

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## Traditional Potters

India is home to more than a million potters. Different regions of India have different and distinct character that reflects in the artworks. There is an astounding variety of shapes, sizes and designs - depending upon the location of its creation. The pretty, unglazed matkas piled high in various cities across the country are usually made with locally available clay.

Traditional local potters usually work as a community and are involved in production pottery. Their work is very need based and occasion specific. Their production largely comprises of unglazed kulhars, matkas for kulfis, ghadas for puja, haandis, toys, dolls, wall hangings, lanterns and diyas for diwali. Their pots are fired in the primitive way of digging a trench or a pit into the earth!



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## Clay

Clay differs from the inelastic earths and fine sand because of its ability, when wet with proper amount of water, to form a cohesive mass and to retain its shape when molded. This quality is known as plasticity. When heated to high temperatures, it also partially melts, resulting in the tight, hard rock-like substance known as ceramic. A typical clay body usually consists of china clay, ball clay (added to increase workability and plasticity), potash feldspar, silica and than clay. These are available in the market, ready to use. The most common types of clay are earthenware, stoneware and porcelain.

Wedging the clay is the primary and most important step of pot-making. It is done before any other activity to help compact the clay and get air pockets out, ensuring that it is uniform in stiffness. If the clay body isn't wedged properly, the chances are one won't get the pot right. Quite interestingly, on the contrary, if the body is wedged well, throwing will be almost effortless.



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## Hand-Building

Hand-building is the earliest, most individualized and direct forming method. It literally stands for ‘building something with the hand’. It is slower and more gradual than wheel-throwing but it offers the potter a high degree of control over the size and shape of wares. Most commonly used hand-building techniques are:

- Coil
- Slab and
- Hollow-ball

Coil:

Coiling is done by rolling clay in between the palms or on a flat surface. Pots can be made by forming these coils and putting them on top of each other, joining them with slip (a runny mix of clay and water). The base of the pot can be prepared by making a round slab. Gaps between coils need to be filled up with wet clay. Two adjacent coil rings can be joined better by marking vertical lines between them. Any detailing or textures can be added to the pot to make it further interesting!



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### Slab:

Clay can be rolled out into thin slabs by a rolling pin on an even platform. These are usually made on either a plastic sheet or fabric so that it doesn't stick to the table top and can be lifted easily. Pots can be made by combining these in different ways. A lot of other things like wind-chimes and fridge magnets can be made too.



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### Hollow-Ball:

Hollow ball technique is used to make pots or utilitarian things (like piggy bank, toothbrush holder etc.) that are hollow. This is done by slicing a clay ball in two halves, scooping out clay from two hemispheres and joining them to form a whole. Walls of the two hollow halves are pricked and slip is applied on them to join well. Sometimes a coil is applied along this joint for strength. Then, sponging and smoothening out is done to make it look well finished. Detailing can be done at this stage.



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## Throwing

Wheelwork can be used to create wares with radial symmetry on the vertical axis. These can then be altered by pressing, bulging, carving, fluting and by other methods making the wares more visually interesting. Often, thrown pieces are further modified by making handles, lids, feet, spouts and other functional aspects are added using the techniques of hand work. The process constitutes of:

- Throwing : Placing the ball of clay in the center of the wheel head (though the word 'throwing' is used for pot-making on wheel in general).
- Centering: Pressing the ball of clay downward and inward into perfect rotational symmetry.
- Opening : Making a hollow in the center of the solid ball of clay.
- Flooring : Making the flat bottom inside the pot.
- Pulling : Drawing up and shaping the walls to an even thickness.
- Shaping : Giving the pot the desired shape by applying varying pressure on the inside and outside of the pot.



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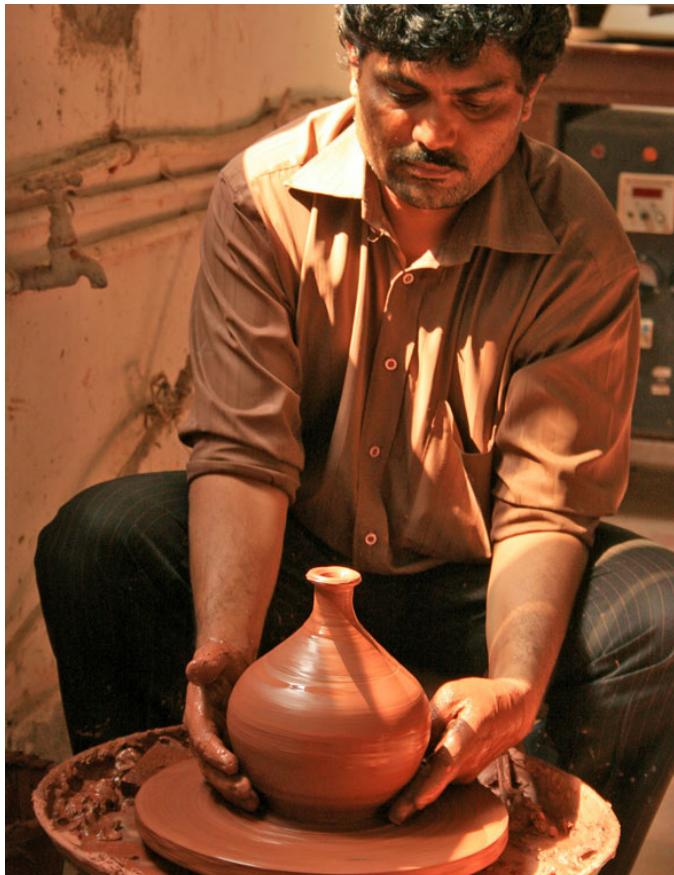
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### Hump throwing

Instead of making one pot at a time and removing it from the wheel, hump throwing is done to make many small pots from a big lump of clay. The steps followed are the same as in throwing a bigger pot. These are removed one after the other from the lump by using a thread. This, undoubtedly, needs a lot of practice. It is a faster way of 'production' and saves the time of putting clay on the wheel each time for making a pot.



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## Trimming & Fluting

Trimming a pot is about removing excess clay to refine its shape when it is leather-hard. This is done by centering the pot on the wheel or by hand-holding it. Since the rim is usually well finished during throwing itself, the base of the pot is worked upon and a foot-ring is marked for the pot to get a distinct contour.

Trimmings (dry shavings) are wetted and recycled to prepare fresh clay! Engraving, embossing, creating textures on the pot is called fluting. It also includes attaching handles or decorating it with hand-built clay pieces. This is done after trimming, while the pot is leather-hard (neither too wet, nor too dry), after which it is not possible to do much because they are too dry and liable to break.



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## Bisque Firing

After the pot is finished being worked upon it is left to dry naturally. There is shrinkage to which is generally 4% to 10%. When they are quite dry, their bisque firing is done in kilns that are heated by burning wood, coal, gas or by electricity. Modern kilns powered by gas or electricity are cleaner, more easily controlled and often allow shorter firing cycles. Bisque firing is the first time the pots go through high temperature heating. It is done in order to vitrify the clay pots enough that they won't be harmed when glazes are applied, but not vitrified to such an extent that the glaze won't adhere correctly. A very slow temperature rise is critical. If heated too quickly, the water will turn into steam while inside the clay body, causing the clay to burst.

During the beginning of the bisque firing, the last of the atmospheric water is driven out of the clay. When the kiln reaches about 350 °C, the chemically bonded water begins to be driven off. By the time it reaches 500 °C, the clay becomes completely dehydrated. At this point, the clay is changed forever (now a ceramic). The bisque firing continues until the kiln reaches about 850-900 °C. At this temperature, the pots are sintered, made less fragile while still porous enough to accept the application of glazes. Once the desired temperature has been reached, the kiln is turned off and allowed to cool down.

Bisque firing pots is actually quite important process. This allows the potter to do much more decorative work with stains, under-glazes and glazes with a greatly reduced risk of the pot being damaged or exploding during glaze firing.



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## Glazes

A glaze, basically, is a type of glass that is especially made to stick onto pots and other ceramic surfaces. Vitrification is the process of melting that clay and glaze go through as they are fired to maturity. In a fully matured clay body, the spaces between refractory particles are completely filled up with glass, making the clay body impervious to water. Glazes provide strength, color, finish and impermeability.

#### Glaze Application:

Glazes are applied onto bisques pots by dipping, spraying or brush. Before doing that, a coat of wax is applied at the base so that the glaze doesn't trickle down and stick the pot to the shelf of the kiln. Wax can also be applied for experimenting with wax-resist glazing effects.

A glaze has four key components:

- Silica, the Glass Former:

Silica is both the base material for glass and for ceramic glazes. It melts at about 1710 °C. It can be introduced into glazes as silica oxide, flint or silica sand.

- Fluxes, the Melting Agents:

Fluxes lower the melting point of silica, making it usable to create ceramic glazes.  
Eg. Feldspar.

- Alumina, the Refractory:

Alumina or aluminum oxide is used in nearly all glazes as stiffening agent, allowing glazes to stick to a pot's vertical surface without running off when it has melted.

Eg. China clay.

- Colorants and Glaze Modifiers:

Silica when melted is transparent. Colorants like metal oxides and stains are added to glazes to produce a wide range of hues.

Eg. Manganese dioxide, copper oxide, cobalt oxide. Three main factors affecting glaze color are the composition of the glaze, the temperature to which the glaze is fired and the firing process (oxidation or reduction).

In addition to colorants, glazes can also have other modifiers. These may modify the glaze opacity, iridescence or working qualities when the glaze is still raw (unfired). Matting agents like barium carbonate and titanium dioxide are used sometimes.

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#### Glaze Firing:

During the glaze firing, clay goes from this soft, totally fragile substance to one which is rock-hard, impervious to water, wind, and time. The change is nearly mystical in its complete metamorphosis. The most common kiln designs utilized by contemporary potters are the natural gas updraft kilns and electric kilns.

A thermocouple (heat sensor) is fitted through the wall of the kiln to read the varying temperature on a pyrometer.

- 100 °C: Water boils.
- 100-200 °C: Clays lose 'mechanical water'.
- 374 °C: 'Critical' temperature of water. Chemically combined water leaves clay.
- 500 °C: Red glow in kiln.
- 573 °C: 'Quartz inversion'

(Quartz has a crystalline structure that changes at specific temperatures, actually causing the pot to increase in size by 2% while heating, and lose this 2% as it cools. Ware is fragile during this and the temperature must be raised slowly through the change. Careful firing is required until 600 °C. (approximately 100 °C per hour).

- 800 °C: All organic matter in clay burns out by this temperature (carbon and sulfur).
- 800-1000 °C: Orange color in kiln. The clay particles begin to fuse (sintering). Low-fire earthenware and lowfire lead glazes mature. Normal firing temperature for red bricks and flower pots.
- 1000-1160 °C: Yellow color in kiln. High-fire earthenware matures. Feldspars begin to melt.
- 1170-1190 °C: Bright yellow-white color in kiln. Midrange clays and low-fire stoneware mature.
- 1250-1285 °C: White color in kiln. Stoneware clays vitrify, feldspathic glazes mature.
- 1285-1350 °C: High-fire stoneware, porcelains vitrify.
- 1712 °C: Silica melts.
- 2050 °C: Alumina melts.

#### Soaking:

Soaking a kiln means to keep it at the same temperature for a period of time. This gives the ceramic materials time to absorb more heat, and the glazes time to smooth out. Generally, a twenty to forty minute soak at the end of the glaze firing is appropriate. The burners should then be put off and the kiln be left to cool for couple of days (till it reaches room temperature) before it is opened to see the final product.

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## End Product Silde Show

Few of the Final or End Products are mentioned below:



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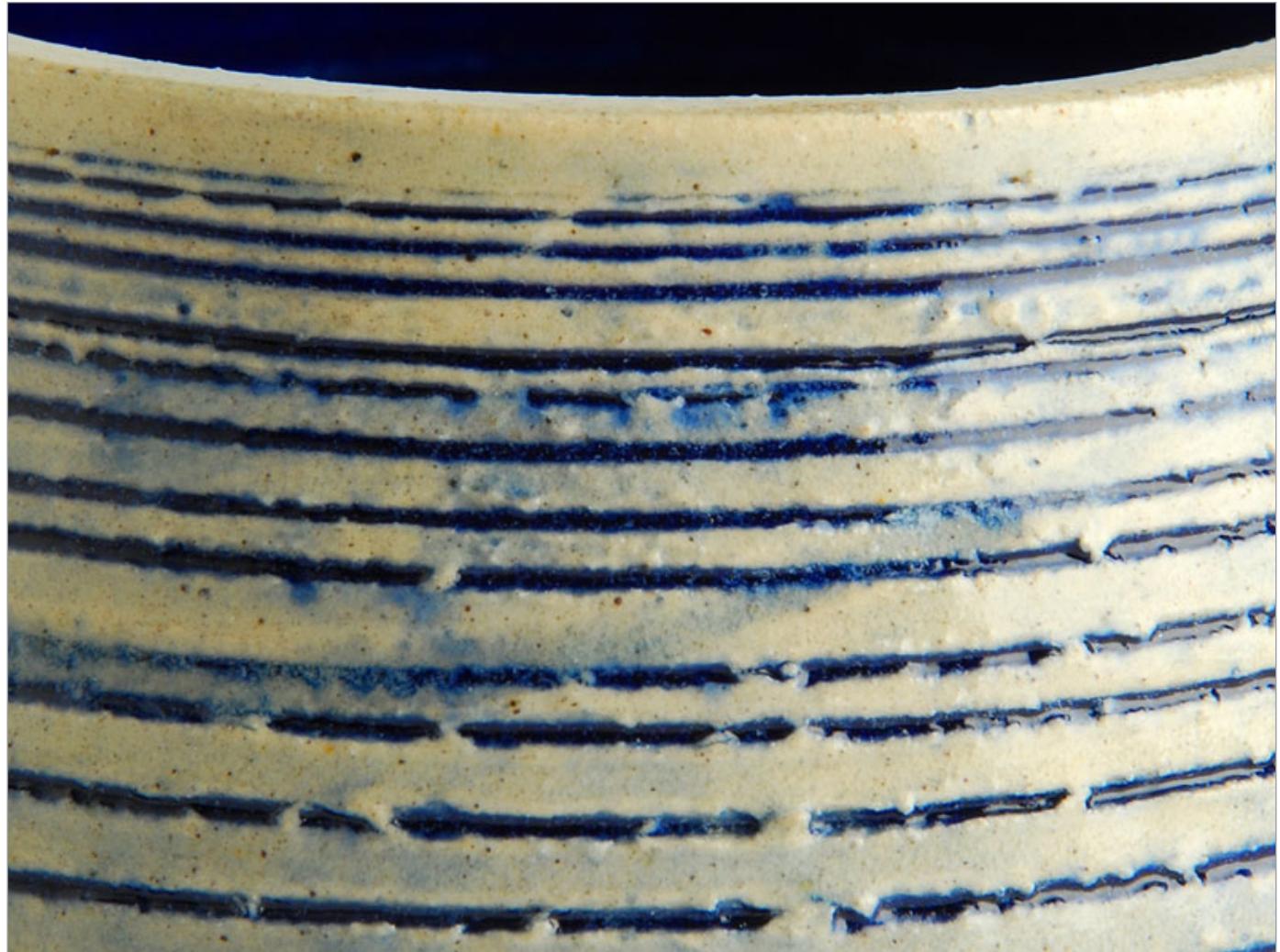
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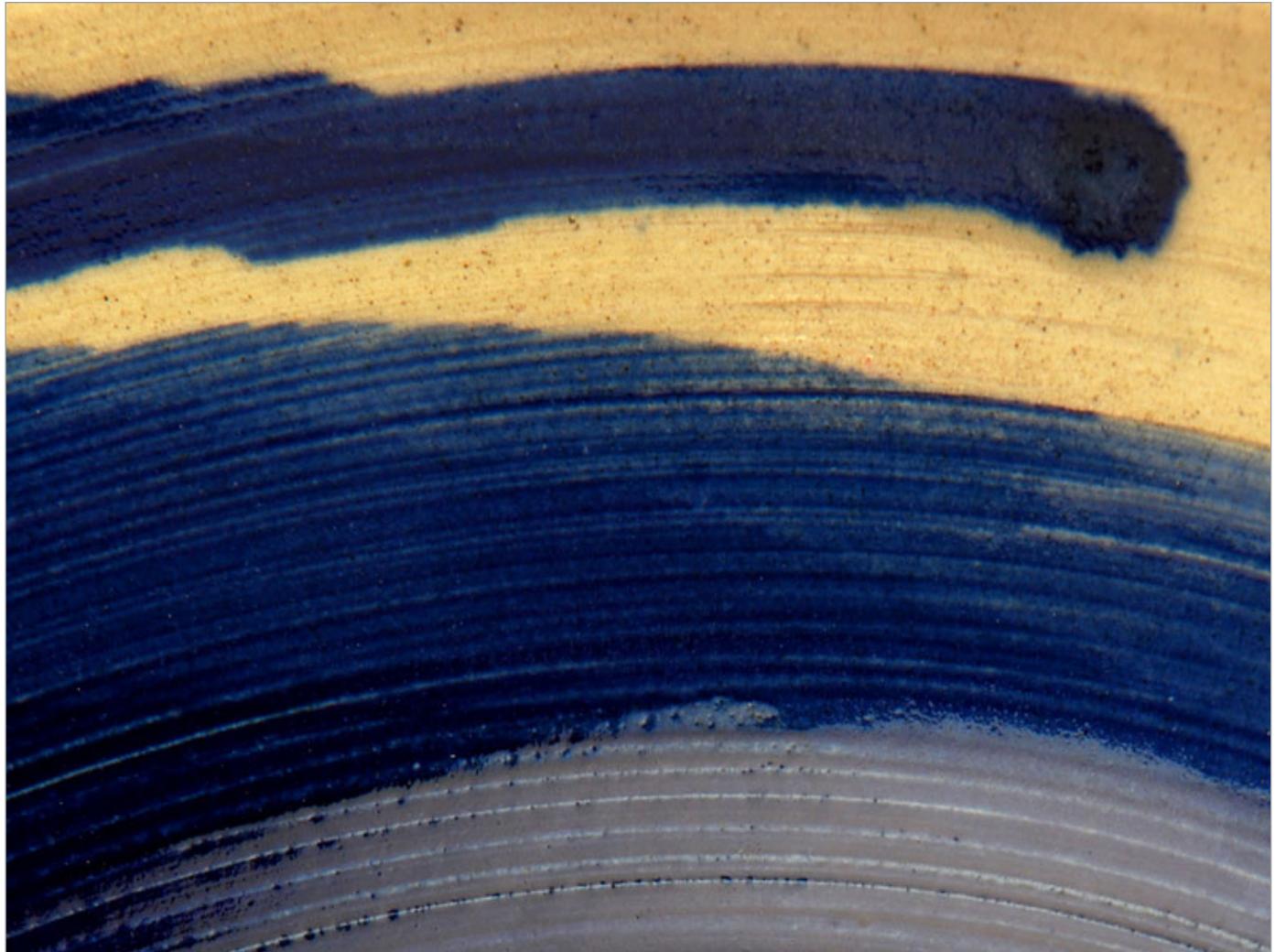
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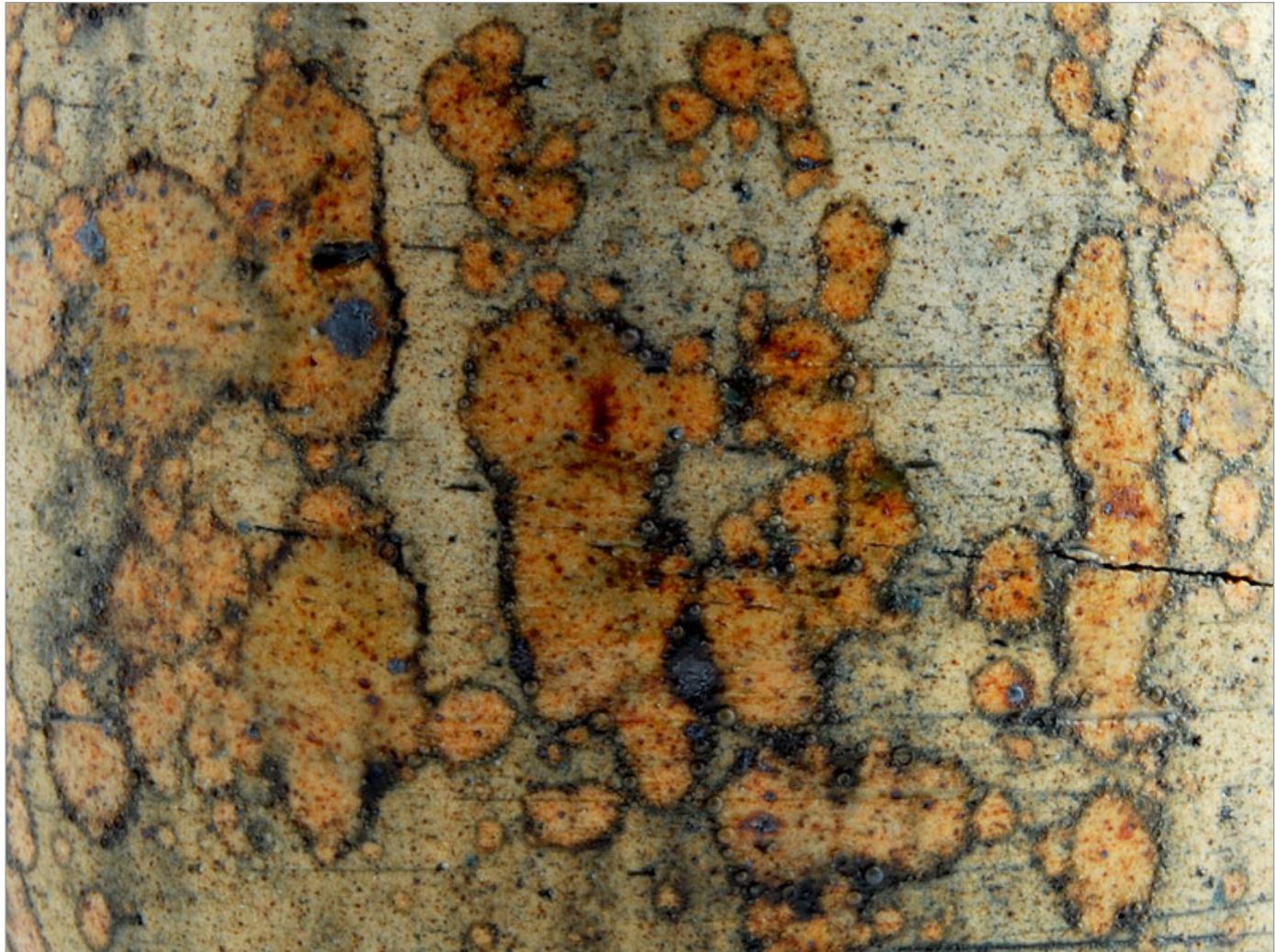
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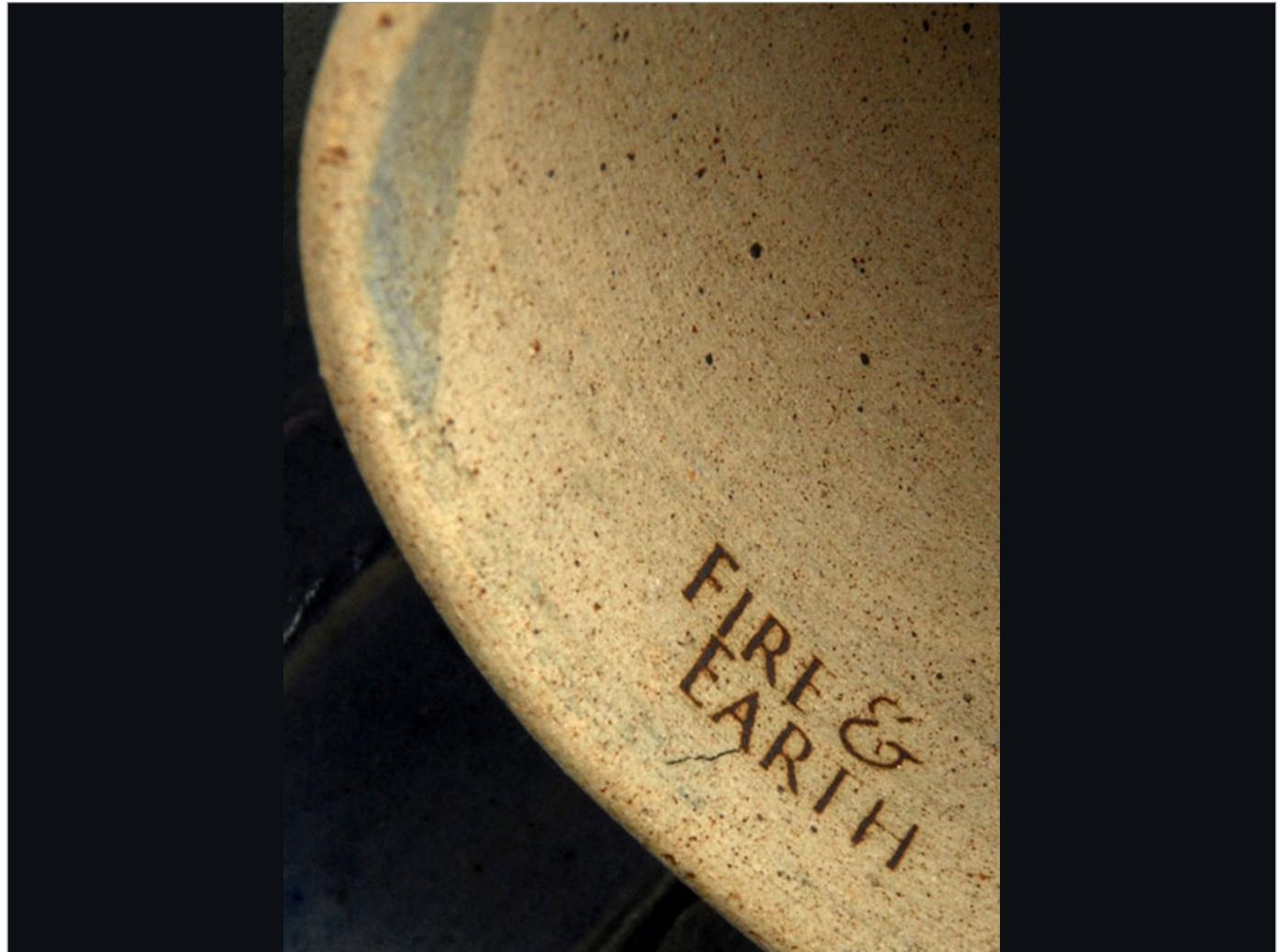
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## Things to Remember

Few important points to be remembered while making the clay craft are:

- Apply bat wash to the shelves of the kiln to avoid glaze run-offs and stuck pots.
- Mix the glazes too well, or the glaze wouldn't stick properly to the clay body.
- Do not use tap water.
- Glaze should be the right consistency. Too thick will crack up or not stick, too thin will run off.
- Dipping is a good way to get a uniform glaze.
- Stronger glazes should generally be applied in the end or they stain the other glazes.
- Record placement of the pots in the kiln for reference. Always!
- Pots need to have optimum spacing between each other in the kiln. Neither too much, nor too less.
- For both bisque and glaze firings, pack the kiln as tightly as possible.
- If you hear pinging from inside the kiln, it is the noise of the glaze cracking. This means the kiln is cooling too quickly. Close the kiln.
- Never fire without a back up cylinder.

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Pot Making



Hand Building

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This documentation for the course was done by Sakshi Gambhir, M. Des. Student at IDC, IIT Bombay.

You can get in touch with her at [sakshigambhir\[at\]gmail.com](mailto:sakshigambhir[at]gmail.com)

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