

Ceramics:

Covering the Basics

An introduction to all things ceramic for most
but a walk down memory lane for others.

Essential Questions: things you will be able to answer at the end of the notes...

- What are ceramics?
- What is clay really and why is it important to know?
- What process does clay go through to become a finished art piece?
- Why is understanding water management important?
- What are the techniques there to manipulate clay? How can you tell which ones to use?

The Basics

Clay...

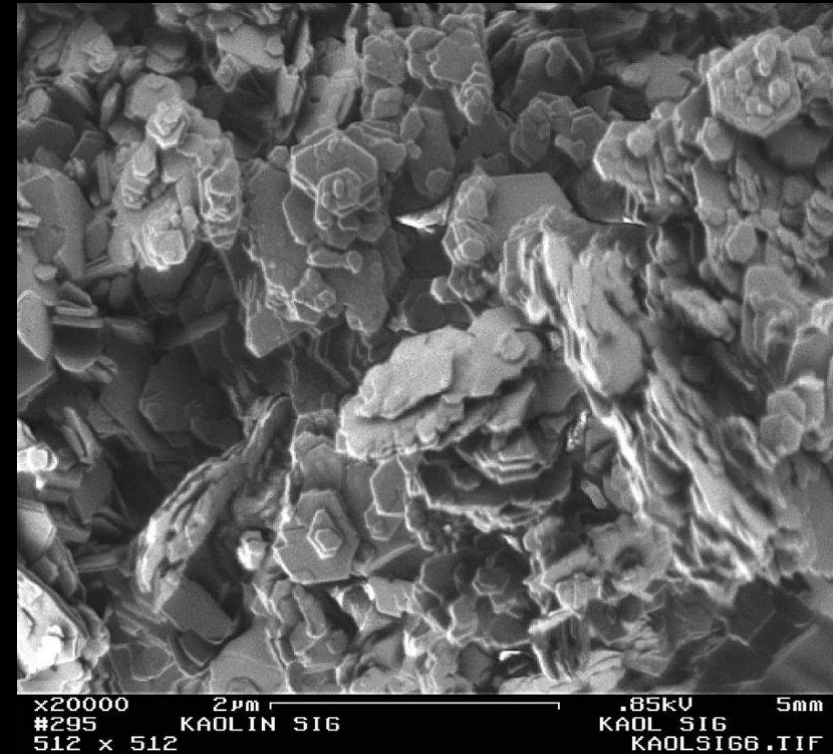
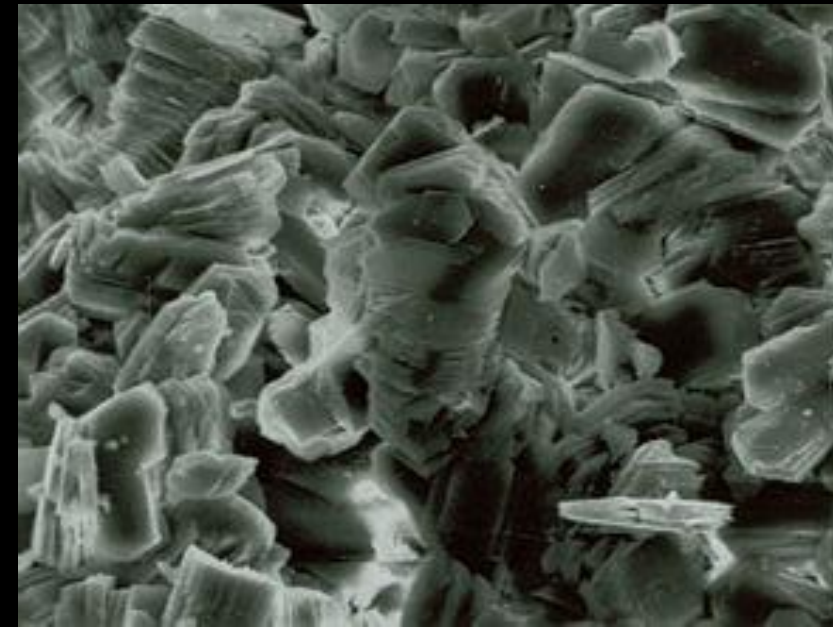
- is decomposed Granite (an igneous rock)
- Another name for it is Kaolin
- Is not dirt. Dirt is mostly decomposed dead stuff (usually plant matter)
- Minerals in clay are basically hexagonal shaped discs.
- When clay is heated to high temperatures the crystals melt and fuse together. When this happens the clay becomes ceramic.



The Basics (Continued)

Chemical compounds of clay and their properties

- Silica (SiO_2)
 - The main compound found in minerals like quartz and sand
 - When heated to high temperatures crystals fuse together to make glass
 - Melting point of pure Silica = 3,110 F = 1,710 C
- Alumina (Al_2O_3 and AlO)
 - It is a Flux. A flux is a compound that helps lower the melting point of Silica.
 - Alumina and other fluxes can help lower the melting point to as low as 1112 F or 600 C.
- Water (H_2O)
 - Physical water
 - present in clay allows for the clay to be shaped and molded.
 - Atmospheric water
 - is the water vapor still present in the air we are breathing
 - Chemically Bonded water
 - water helps the high temperature chemistry work- it provides the oxygen needed to change AlO to Al_2O_3 . It helps change clay to ceramic.



Describing Clay

- Plasticity
 - Describes how easily clay can be molded and hold its shape
 - The more plastic a clay is the more movement the clay has to it
- Clay Body
 - Clay mixed with other ingredients to change the properties of the clay
 - The other ingredients can change what color it is, what temperature the clay will melt at, and can make it more/less plastic.
 - The temperature it melts at
 - Low-fire and Bisque = 18000F or Cone 04
 - Mid –fire = 2100F or Cone 6 ***what we work with
 - High-Fire = 2300F Cone 10
- Water Content
 - How much water is present in the clay will change the physical properties of the clay as you are working with it.
 - Slip, plastic, leather hard, bone dry, greenware are all terms used to describe levels of water present in the clay.

Water Management

note: Clay shrink's as water is removed

Highest water content

1. Slip
2. Plastic Clay
3. Leather Hard
4. Bone Dry /Green-ware

Can still recycle clay up to this point

5. Bisque-ware
6. Ceramic-ware

Lowest water content



Water Management

1. Slip (highest water content)

- Watery clay, clay mostly suspended in water to the consistency of toothpaste.
- Basically the “glue” used to help join clay together
- So much water its beyond plastic
- Used to create razed decorations by using a process called Slip Trailing

2. Plastic Clay

- Just enough water so clay can be shaped and molded and still hold its shape.
- Good time for stamping, pinch-pot and coil building,
- Cool to the touch

Water Management

3. Leather Hard

- Stiff like leather, will break if not careful
- Best time for: slab construction, carving details, and smoothing out surface
- Must use Slip n' Scoring to join clay
- Still cool to the touch (water is still evaporating out of the clay)

4. Bone Dry /Green-ware

- Green-ware is when a project is finished, bone-dry, and ready for first firing
- This is the most fragile state for clay!
- Limit handling of project and use as much surface area of hands if needing to move it.
- Never grab projects by the lip or handle at this stage
- Feels dry and sandy, color may look splotch but is much lighter than wet clay
- Bisque-ware (first stage of Ceramic)
- Ceramic-ware (second stage of Ceramic)

Water Management

5. Bisque-ware (first stage of Ceramic)

- First firing at ~1600F-1800F
- Pre-shrinks clay so glaze will sit better on the project and avoids running
- Gets rid of most of the atmospheric water and starts to chemically change the clay
- Can no longer go back to being clay (can't recycle any more)

6. Glaze-ware (second stage of Ceramic)

- Final Firing after glaze is applied.
- Chemically pulled all water out of remain clay
- Coated in think layer of glass that provides a more durable surface which is also easier to clean.

Firing Clay

- Firing= Baking in the ceramic's world
- Clay can be baked in a special oven called a kiln or in an open pit fire
- Vitrification is the point clay will start melting.
- The temperatures in kilns/fires are measured by:
 - Pyrometric Cones = glazes that melt at specific temperatures
 - Pyrometers = thermometer's designed for high temperatures
 - Color = the color of the glow objects in the fire/kiln correspond to specific temperatures.

Finishing Ceramics: Glazing

- The important differences between glazes and clays
 - Glaze has more silica and flux than clay = more glass like
 - Has more impurities to increase the range of colors
- The Purposes for Glazing
 - Decoration
 - Helps protect the by creating a harder protective surface.
 - Creates a clean smooth surface for cleaning (important for functional ware like plates, cups, bowls)
- Glazing Application Techniques
 - Antiquing
 - good for enhancing texture
 - Paint or dip project then wipe of glaze from raised surface
 - Painting
 - using paint brushes to deposit glaze
 - Good for more precise application of glaze
 - Overload bush with glaze, wipe on surface, let dry, then repeat.
 - Don't try to go over an area with more than one pass before it dries
 - Dipping
 - Submerging piece in glaze

How to Glaze a ceramic piece

1. Clean Piece :
 - get rid of any dust, ash, ceramic crumbs, etc. Just need to wipe surface with a sponge.
2. Mix glaze:
 - mix till all sediments are evenly distributed/suspended in water.
 - Hand is really the best tool, but potter's thumb works well for smaller containers- all glazes we use are non toxic- just make sure you wash hands with soap before eating anything.
 - Should be the consistency of thick milk (ask for help if it isn't)
3. Apply to thickness of a credit card
 - Dip= hold under surface for 2 full seconds
 - Painting = 2-3 thick even coats
 - Antiquing can be done by it's self or under the other 2 application techniques.
4. Wipe Foot
 - Clean any surface that will touch the kiln shelf and a ¼ inch up from it
 - Press project on a damp clean sponge and twist back and forth a few times.
 - If you skip this step your project won't get fired until it's fixed because it will ruin the kiln

Vitrification

- The process of clay/glaze melting
- Glaze when it's vitrified is molten glass and has the consistency of thick honey and can run like honey too
 - Runny glazes = vitrify fast and can run down projects a lot, especially if too thick
 - Non-Runny glazes will be less likely to run when they achieve vitrification
 - If glaze doesn't reach vitrification it will look chalky, hazy, sometimes can peel off.
- When clay vitrifies it becomes soft and can warp, even collapse if it's really thin and depending on what the piece is (something upright like a cup or flat like a tile)
- Clay won't stick to stuff when it reaches vitrification but Glaze will!

Tools:



Revisiting the Essential Questions: now answer these questions on your own based on what you've learned...

- What are ceramics?
- What is clay really and why is it important to know?
- What process does clay go through to become a finished art piece?
- Why is understanding water management important?
- What are the techniques there to manipulate clay? How can you tell which ones to use?

Check how your answers compare to these...

- What are ceramics?
 - It is a medium of art that is also one of the oldest known as well. Mined minerals mixed with water make clay which can be sculpted and formed into objects that can be fired to permanently keep its shape. The objects made were traditionally made for utilitarian purposes but can also be made for purely aesthetic purposes as well. Many contemporary artists like to experiment with the form and function ceramics has to offer.
- What is clay really and why is it important to know?
 - Clay is decomposed Granite (an igneous rock). Knowing the chemical properties of clay can help inform what other chemicals you may want to add to it to change its properties like: what color it is, what temperature it melts at, and the level of detail it can hold.
- What traditional process does clay go through to become a finished art piece?
 - Mined mineral -> slip -> plastic -> leather-hard -> bone-dry/Greenware -> Bisqueware -> Glazeware
- Why is understanding water management important?
 - Artists need to understand how water content affects the shrinking of clay so the project will be more likely to turn out the way the artist intended.
 - It also helps the artist know what to plan for- for example some details are easier to add when clay is more plastic and others when it's leather hard.
 - Artists need to know at what stages clay can and can't be recycled to more responsibly manage their supplies.
- What are the techniques there to manipulate clay? How can you tell which ones to use?
 - Additive, Subtractive, Coil building, Slab building. Pinch-Pot, Pour-Molds, and slipping-scoring are the most common ways to manipulate clay and it is common to use a variety of techniques even if one technique dominates most of the process.
 - Practice and experience will help artists gain a better understanding of which techniques are more effective or efficient for specific tasks.