

RAW MATERIALS

INTRODUCTION

As a major supplier of raw materials to the ceramic industry, we strive to offer our customers consistent, top quality materials that are competitively priced. On the following pages you will find a listing of chemicals and materials currently available from Laguna Clay Company. These products are listed in the following sub-categories: Materials, Raw Clays, Frits and Stains. It is our intention in preparing this section to give you, the user, as much information as possible about these products. When available, the chemical formula of the material is given. We hope this section is useful to you as a reference guide to materials relevant to the ceramic field.

LIABILITY STATEMENT

The materials available through this catalog are in grades of purity which are most useful in the ceramic industry. Some of them are not "pure" compounds, and therefore, we are unable to warrant the consistency of these materials from batch to batch. We urge you to make thorough tests every time a new material or lot is purchased.

HEALTH CAUTION

An ever-increasing number of the earth's raw materials are reported to contain elements deemed "toxic," "carcinogenic," or a "potential health hazard." Utilizing information provided by California Proposition 65, SARA Title III and manufacturers' Material Safety Data Sheets (MSDS), we have identified these raw materials with an asterisk. The MSDS describes the nature of the potential hazard as well as recommendations for safe use of the material. For a copy of the MSDS, visit www.lagunaclay.com/msds/, or contact Laguna at (626) 330-0631 or info@lagunaclay.com.

DRY RAW MATERIALS

ALBANY SLIP SUBSTITUTE* SG-328

Through years of formulation and reformulation, Karl Miller developed Albany Slip Substitute which is intended to reproduce the physical and performance characteristics of the famed Albany (NY) Slip once mined only two hours from Miller's ceramic lab. See also Alberta Slip clay and Arroyo Slip clay.

ALBERTA SLIP CLAY*

A popular Canadian blended substitute for the old Albany (NY) Slip. Albany Slip was frequently used as a glaze additive, and boasted a high proportion of fluxes, which combined with a very fine grain caused it to melt at around 1240°C. See also Albany Slip Substitute and Arroyo Slip.

ALUMINA HYDRATE Al(OH)₃

The usual source of alumina in glazes.

ALUMINA OXIDE Al₂O₃

Responsible for the mattness or brilliance of glazes. Prevents devitrification and adds strength. Insoluble in water and melts at 3550° F. Use of too much alumina can cause a dry appearance.

ANTIMONY OXIDE* Sb₂O₃

Derived principally from stibnite, it is used in combination with rutile and titanium in pottery as a yellow body stain and frequently it is used in glass as a decolorizing agent and in ruby red compositions.

ARROYO SLIP CLAY*

A naturally occurring slip glaze mineral. Very similar in color and texture to Albany Slip.

BARIUM CARBONATE* BaCO₃

This is the main source of barium oxide in glazes where it functions as a flux and assists in producing matte finishes. It is also used to neutralize sulfates in clay bodies. We recommend German barium carbonate for use with clay and either German or Chinese barium carbonate for use in glazes.

BENTONITES* Al₂O₃.5SiO₂.7H₂O

A very plastic magnesium clay containing colloidal matter which in small amounts lends plasticity to a clay body. Also used as a suspending agent in glazes.

325 MESH

We recommend Bentonite 325 mesh as a standard glaze and clay additive.

BENTOLITE L-10

Our whitest Bentonite. For use in clay bodies, especially in conjunction with Macaloid in porcelains.

HPM-20

Ultra-fine ground, air-purified Bentonite recommended when a finer grade than 325 is needed for glaze applications.

IBEX-200

Low-grade California Bentonite.

MACALOID (BENTONE MA)

A suspension agent which increases the drying rate of water suspended glazes. It is similar to a very clean, white type of Bentonite. Also used as a plasticizer in fine porcelain.

VEE GUM CERAMIC

A blend of Vee Gum-T and CMC for use in glazes.

VEE GUM-T

A macaloid-type Bentonite suspension agent for glazes. Also used as a surface hardener. It is an extremely plastic, hydrous magnesium silicate used to give plasticity to non-plastic whiteware and refractory bodies. Very similar to Macaloid.

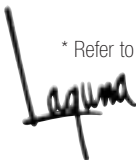
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BONE ASH Ca ₃ (PO ₄) ₂ ·CaCO ₃	An important source of calcium phosphate. When added to a clay body such as bone china, it lowers the maturing temperature and adds translucency. Also used to give texture in low fire glazes.		
BORAX Na ₂ O·2B ₂ O ₃	A water soluble, low temperature flux which lowers the fusion point of glazes and promotes a smooth melt. Produces bright colors with oxides. Also a source of sodium and boric oxide in glazes. Available in granular and powder.		
CARBOXY/METHL CELLULOSE (C.M.C.) POWDER	An organic cellulose gum which functions as a thickener, binder and suspending agent in glazes. Mix with water to dissolve and age before adding to a liquid glaze.		
CALCIUM BORATE "CADYCAL" Ca ₂ B ₆ O ₁₁ · 5H ₂ O	A precipitated calcium borate mineral.		
CALCIUM CARBONATE* CaCO ₃	The most common source of calcium in glazes. It is a high temperature flux which gives durability and hardness to glazes. Includes Whiting, Vicron, Marblewhite, and Atomite.		
CALCIUM NITRATE Ca(NO ₃) ₂ ·4H ₂ O	A water soluble compound that is used as a thickener in glaze preparation.		
CHROMIUM OXIDE-GREEN* Cr ₂ O ₃	A versatile colorant used in glazes to produce various green tints.		
COBALT CARBONATE* CoCO ₃	A fine particled, lavender powder used as a glaze colorant and for brushed decoration. Produces various shades of blue and when manganese is present can give purple.		
COBALT OXIDE* Co ₃ O ₄ , CoO	A reliable, stable black powdered oxide. In small amounts it produces consistently strong blue tones. Used as a glaze colorant and brushing oxide decoration.		
COBALT SULFATE* CoSO ₄ ·7H ₂ O	A water-soluble reddish powder, sometimes used in white clay bodies and glazes to create a "whiter" appearance as a result of imparting a bluish tint; in other words, a cold white vs. a warm white.		
COPPER CARBONATE* CuCO ₃ (OH) ₂	A green powder used as a glaze colorant. Depending on conditions and formulation it may produce green, blue-green or copper red.		
COPPER OXIDE-BLACK* Cu ₂ O	This is the oldest glaze colorant known. It is a strong flux and will produce fluid glazes. Can produce copper reds in reduction firing.		
CORNWALL STONE* NaK ₂ O·Al ₂ O ₃ ·8SiO ₂	A type of spar used in clay bodies to give strength while firing. Also used in engobes because of its adhesive properties. With the addition of a suitable flux, Cornwall Stone can be used as a glaze. Sometimes called English Cornish Stone.		
CRYOLITE Na ₃ Al F ₆	Synthetic Cryolite (Kryolite). A strong fluxing agent with a very low melting point. A good sodium-alumina source. Occasionally used as an opacifier for enamels, or to produce crackle glazes.		
DEXTRIN	An organic binder used mostly with plaster.		
DOLOMITE (Dolowhite)* CaMg (CO ₃) ₂	Useful as a source of calcium and magnesium. It can be used as a high temperature flux and also to promote crystal formations.		
DYES (Water Soluble)	Aniline Brown Black—12525 Victoria Green	Blue 2-B Methylene Red Rhodamine B	Methyl Violet 125% Yellow
	The above colors are commonly used by manufacturers to color code similar appearing clay or glaze batches.		
ERBIUM OXIDE	A pink colorant used in the manufacture of crystal glass and ceramic glazes. Used in glaze as a pure oxide versus stain, excellent transparency and translucency can be achieved. See also, neodymium oxide and praseodymium oxide.		
FELDSPARS:*	Crystalline minerals made up of mainly alkaline silicates. Used extensively in both clay and glaze formulation.		
CUSTER	A standard potash spar used in clay and glaze formulas. Mined in Custer, South Dakota.		
G-200	A potash spar, low in impurities, well suited for white glazes and porcelain clay bodies.		
KONA F-4 (Soda Spar)	A widely used eastern U.S. soda spar.		
PRIMAS P	A Mexican potash feldspar for use in clay bodies and glaze formulas.		

FELDSPAR TYPICAL ANALYSIS CHART

NAME	SILICON DIOXIDE SiO ₂	ALUMINA OXIDE Al ₂ O ₃	IRON OXIDE Fe ₂ O ₃	CALCIUM OXIDE CaO	MAGNESIUM OXIDE MgO	SODIUM OXIDE Na ₂ O	POTASSIUM OXIDE K ₂ O	LOSS ON IGNITION
Custer	68.5	17.5	0.08	0.03	Trace	3.00	10.4	0.3
G-200	67.5	18.5	0.09	1.15		3.24	9.4	0.2
Kona F-4	66.8	19.7	0.04	1.8		4.50	7.0	0.2
Primas P	66.5	18.5	0.077			3.50	10.31	0.1

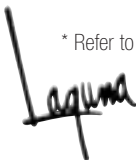
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FLUORSPAR CaF ₂	This crystalline mineral has a lower fluxing temperature than other calcium compounds. It can be used as a substitute for whiting to promote more fusible glazes. Insoluble in water, it should be used at 100 mesh or finer or it can cause mottling in glazes.
GERSTLEY BORATE Na ₂ O.2CaO.5B ₂ O ₃ .16H ₂ O	A sodium-calcium-borate compound used as a low temperature flux which helps prevent crazing. Can act somewhat as an opacifier. Standard substitute for Colemanite.
GROGS:*	A hard fired clay which is crushed to various mesh sizes. Added to throwing and sculpture clay bodies to increase working strength and reduce shrinkage. Also aids in drying thick pieces.
MISSOURI FLINT	A calcined Missouri fireclay, this flint grain material possesses less iron than many other fireclay grogs. Available in the following mesh sizes: 20x48; 14X28; 20-F; 35-F; 50 mesh; 70 mesh super fine.
MULCOA	A white mullite grog used in light clay bodies. Available in 48 and 200 mesh.
RED BRICK	Ground ceramic sewer pipe grog. Fired to Cone 9. Precision ground to finer than 48 mesh.
GUM ARABIC	A powdered natural gum material used as a binder and suspending agent in glazes.
IRON CHROMATE* FeCrO ₃	Produces dark colors in engobes and underglazes. Can also be added with manganese compounds to clay bodies as a colorant.
IRON OXIDES:*	
BLACK 5599 Fe ₃ O ₄	Ferrous ferric oxide. A more concentrated form of red iron oxide.
BROWN 521 Fe ₂ O ₃	A natural iron oxide. Reddish-brown raw color.
RED 4284 Fe ₂ O ₃	Ferric oxide. Produces various shades of brown or green when used as a glaze colorant or decorative oxide. In high fire matte glazes, iron oxide and titanium can produce reddish colors. Our most commonly used iron oxide in both clay and glaze.
RED DOMESTIC	Same as Brown 521.
RED SPANISH Fe ₂ O ₃	81% Fe ₂ O ₃ , this imported, natural iron oxide is bright red in its raw form.
YELLOW Fe ₂ O ₃	A weaker form of iron - high clay content.
KRYOLITE	See Cryolite.
KYANITE* 3Al ₂ O ₃ .2SiO ₂	A refractory material used to reduce shrinkage in clay bodies and give strength to the body. Can form mullite during firing. Available in 35, 48, 100 and 200 mesh.
LAGUNA BORATE	A specially formulated flux containing a high percentage of boron. This material mimics the fluxing characteristics of Gerstley Borate.
LEAD*	
LEAD BISILICATE (Ceraflux) PbO.2SiO ₂	A fritted source of lead and silica which is safer to handle than lead monosilicate and raw lead. Lead bi-silicate provides a low solubility source of lead in glazes.
LEAD CARBONATE (White) 2PbCO ₃ .Pb(OH) ₂	A once important raw material but now seldom used due to high toxicity. It is a strong flux which promotes an extremely smooth glossy finish. (White lead).
LEAD MONOSILICATE 3PbO•2SiO ₂	This is a fritted source of lead and silica which is safer to handle than raw lead because it is bonded in glass. The melting point is 725-750° C. Lead Monosilicate is free from uncombined lead oxides and silica.
LEAD OXIDE RED Pb ₃ O ₄	This ultra high purity red lead is often used as a flux due to the greater amount of oxygen present. Produces a smooth bright glaze.
LITHARGE 100Y PbO	Yellow lead monoxide. A source of lead in frits. Contains impurities and has a larger particle size than lead oxide, but is often used for the same purposes.

LIGNIN	An organic binder. Used to increase the green strength of clay bodies.
LITHIUM CARBONATE* Li_2CO_3	Used as a flux in leadless glazes. It is a source of lithia which is a strong high temperature flux. Improves the brightness of glazes and increases the firing range. Also reduces thermal expansion. Available in fine or coarse.
LITHIUM FLUORIDE LiF	Similar but stronger than the carbonate.
MACALOID	See Bentonites.
MAGNESIUM CARBONATE MgCO_3	Common source of magnesium in glazes. Imparts strength and color with little shrinkage. In larger proportions, it produces a dry, opaque quality in glazes.
MAGNESIUM OXIDE MgO	For refractory applications.
MAGNESIUM SULFATE $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$	Also known as Epsom salts. It can thicken a glaze to improve adhesion to non-porous surfaces. Also acts as a suspension agent.
MAGNETITE (Granular)* Fe_3O_4	A mineral form of black iron oxide. When mixed in clay body or glazes, it produces a speckling effect. (Should be screened due to inconsistent particle sizes).
MANGANESE CARBONATE* MnCO_3	A weak coloring agent. In an alkaline glaze, a blue-purple or plum color can be obtained. In leadless glazes, a purple- brown may result. It is a powerful flux.
MANGANESE DIOXIDE* MnO_2	A black powder which gives red, brown, purple or black tones to clay bodies and glazes. A strong flux when added in large amounts to clay bodies. Available in 40, 60, 200 and 325 mesh.
MICA 325 $\text{K}_2\text{Al}_2\text{Si}_6\text{O}_{20}(\text{OH})_4$	Water ground, 325 mesh powder. Usually added to a glaze formula to aid in craze resistance. Also helps thermal and moisture expansion resistance.
MOLOCHITE	Made of calcined Grolleg kaolin, Molochite is the cleanest, whitest grog available. Used in the whitest porcelain bodies to reduce cracking in drying and firing.
MULLITE* $3\text{Al}_2\text{O}_3 \cdot 2\text{SiO}_2$	Virginia mullite can be added to a clay body to check thermal expansion. It adds strength because of the needle- like shape of its crystals. (Calcined Kyanite) Available in 35, 48, 100 and 200 mesh.
NEODYMIUM OXIDE Nd_2O_3	Has a variety of applications in the coloration and decoloration (by suppressing yellow) of glass. Used in ceramic glazes, this oxide creates spectacular violet, red-violet and blue-violet hues. Use of the oxide in glaze versus stain can yield excellent transparency and translucency. See also, erbium oxide and praseodymium oxide.
NEPHELINE SYENITE* $\text{K}_2\text{O} \cdot 3\text{Na}_2\text{O} \cdot 4\text{Al}_2\text{O}_3 \cdot 9\text{SiO}_2$	Similar to a soda spar. It can reduce crazing tendencies when added to a clay body. Also used in glazes where a soda spar is required.
NICKEL CARBONATE* NiCO_3	Common glaze colorant. Green nickel produces a variety of browns, blues, grays and yellows depending on the presence of other materials in the glaze.
NICKEL OXIDE* NiO	Black nickel produces browns, blues, grays and yellows in glazes. It can also tone down more intense colorants such as cobalt and copper. Maximum use is usually 3%.
OCHRE, YELLOW* $2\text{Fe}_2\text{O}_3 \cdot 3\text{H}_2\text{O}$	A clay (variety of limonite) containing iron and manganese which is used in engobes, underglazes and overglazes.
PETALITE* $\text{Li}_2\text{O} \cdot \text{Al}_2\text{O}_3 \cdot 8\text{SiO}_2$	A lithium feldspar which is used both in clay bodies and glazes to help decrease thermal shock problems.
POTASSIUM BICHROMATE* or Dichromate	Used in glass to give a green color and used in ceramic glazes to produce chrome-tin pink, low-fire reds, greens and purplish-red colors.
POTASSIUM CARBONATE K_2CO_3	Also known as Pearl Ash. It is a strong flux and can be used as a color modifier in glazes.
PRASEODYMIUM OXIDE	Colors glass a distinctive green, but in ceramic glazes it can create a brilliant yellow based on zirconia and silica. The color is compatible with pinks and blues, is unaffected by glaze composition and is stable at ordinary glaze temperatures. Use of the oxide in glaze versus stain can yield excellent transparency and translucency. See also, neodymium oxide and erbium oxide.
PUMICE* $\text{Al}_2\text{O}_3 \cdot 4\text{SiO}_2 \cdot 2\text{H}_2\text{O}$	Also known as Volcanic Ash. It is a type of feldspar which can be used in glazes. It is not desirable in clay bodies.
PYROPHYLITE	A Pyrophyllite with 2.9% iron. Good for thermal shock.
PYROPHYLLITE* $\text{Al}_2\text{O}_3 \cdot 4\text{SiO}_2 \cdot \text{H}_2\text{O}$	An aluminum silicate which is added to clay bodies to reduce thermal expansion. Pyrax ABB, Pyrotrol (Ohio) and Pyrax HS (higher purity grade) are available.

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RAW SIENNA*	An iron-bearing clay which is used as a colorant in engobes, stains, underglazes and overglaze decoration.
ROSEVILLE CLAY*	Low maturing, medium plasticity air-floated stoneware clay with golden buff color at Cone 5. Firing range Cone 2-9.
RUTILE* TiO₂	An impure titanium dioxide tan colorant which contains a small amount of iron. Used both for color and its tendency to provide various mottled textures. Available in Ceramic Grade and Milled (Ruflex 61).
SANDS:*	
CALIFORNIA	Feldspathic silica sands which can be used in place of grog in clay bodies to add texture and strength. Begins to soften at Cone 10.
16	Very coarse 16 mesh silica sand.
30	Coarse 30 mesh silica sand.
60	Medium 60 mesh silica sand.
60-M	Medium to fine 70-90 mesh silica sand.
F-70 OTTAWA	A high purity silica sand from Illinois. (Stocked in Ohio and California).
OKLAHOMA #90 GLASS	A very clean, high purity sand frequently used in glass batches.
CHINA	A sand and kaolin mix, approximately 70-90 mesh.
SILICA* SiO₂	Also known as Flint. This is the most common source of silica in clay bodies and glazes. Increases the thermal expansion in clays and decreases thermal expansion in glazes. Also used to raise the melting point in glaze. Available in 200 and 325 mesh.
SILICA IMSIL A-25* SiO₂	A microcrystalline silica. A very finely divided or "micro" form of quartz physically bound together as loose agglomerates. Although considerably more expensive than silica typically used in ceramic glazes, microcrystalline is considered by some to be the "ultimate" silicate for use in glazes.
SILICON CARBIDE 320 SiC	A reduction agent used in glazes. Ground to 450-600 mesh.
SODA ASH Na₂CO₃	Sodium carbonate. This is an active flux and also serves an important function as a deflocculant in preparing liquid slip. It increases strength and workability and reduces shrinkage.
SODIUM BICARBONATE NaHCO₃	Often used in Egyptian paste clays. (Baking soda)
SODIUM NITRATE NaNO₃	A source of sodium used in porcelain enamels and glass formulas.
SODIUM SULFATE	In the form of salt cake, sodium sulfate is added to glass formulas as a source of sodium and to prevent scumming. Sodium sulfate glasses are harder, stronger and have a higher softening point than soda-lime glasses without the sulfate addition.
SPODUMENE* LiAlSi₂O₆	A source of lithia, which is a flux, that helps to develop copper blue tone glaze. Can replace feldspar and also reduces the vitrification temperature and shrinkage (contraction) rate in glazes and clays. Chemical grade from Australia.
STRONTIUM CARBONATE SrCO₃	Source of strontium oxide in glazes, useful as a flux. Occasionally used as a substitute for Barium Carbonate.
SUPERPAX ZrSiO₄	No longer available. See Zircopax Plus.
TALC:* 3Mg.04SiO₂.H₂O	
CERAMITALC HDT	A carefully blended fractionated talc with fines removed offering excellent pressing capabilities with no lamination and controlled fired shrinkage. In ceramic wall tile and artware it develops high uniform thermal expansion and low moisture expansion to prevent crazing in bodies that can be safely fired at rapid cycles.
NEW YORK (NYTAL 100HR)	Vanderbilt's 100 HR, 200 mesh talc is formulated specifically for "hobby slips and pottery applications." It is a good casting talc which promotes strength and due to the minimal presence of soluble salts, slips using this talc seem to deflocculate particularly well.
SIERRALITE 2MgO.2SiO₂.Al₂O₃.H₂O	A chlorite talc (Montana) with high alumina content and low fluxing oxides. It is used in refractories where low thermal expansion and good thermal shock resistance is required. An addition of 3-5% to many bodies can lower the maturing point of the body up to 2 cones.

PIONEER 2882	A white burning Texas talc low in calcium and grey in unfired state. A high organic talc which yields good green strength and plasticity. A major component in low fire, Cone 06-Cone 2 whiteware clay bodies.
65/35	Texas talc which is 35% calcined. Usually combined with other talcs and excellent in low fire pressing bodies where minimum shrinkage is desired. Assists in faster casting of low fire casting slips.
TDM 92	Similar to Pioneer 2882, but a darker gray in raw form. Fires white.
TIN OXIDE SnO ₂	The most effective opacifier to produce even, opaque, glossy glazes. The normal use of tin oxide in a glaze is between 5% and 10%. A dull matte glaze can result when used in excess.
TITANIUM DIOXIDE* TiO ₂	Insoluble in water. Important opacifier. Often used in glaze to affect acid resistance, color and texture.
TRI-CALCIUM PHOSPHATE Ca ₃ (PO ₄) ₂	Similar to Bone Ash. Will work well in high or low temperature glazes. A white amorphous powder. Insoluble in cold water, decomposes in hot water. When used in most glaze bases (8-15%) will produce a lava effect at Cone 06.
TRI-SODIUM PHOSPHATE Na ₃ (PO ₄) ₂	Added to glaze to produce a matte and foamy surface.
ULEXITE	A naturally occurring boron mineral with many characteristics of Gerstley Borate.
UMBER, BURNT*	A hydrated ferric oxide with manganese dioxide. It is used for brush decoration to produce a reddish-brown. Also can be added to clay bodies to achieve a darker color.
VANADIUM PENTOXIDE*	A common glass colorant producing various tints of yellow and greenish yellow.
VEE GUM-CERAMIC	See Bentonites.
VEE GUM-T	See Bentonites.
VERMICULITE	Exfoliated mica, a low refractory insulating material used for exterior kiln insulation. Also used as a filler to reduce weight of plaster or cement products (See Plaster Section).
VOLCANIC ASH*	See Pumice.
WHITING* CaCO ₃	See Calcium Carbonate.
WOLLASTONITE CaSiO ₃	A natural calcium silicate used to reduce shrinkage in clay bodies and glazes during firing. Can replace silica and whiting. Also aids in fast firing of clay bodies.
ZINC OXIDE* ZnO	A useful, high temperature flux. It increases the maturing range of glazes and produces bright, glossy colors. Also may be used to give opacity to glazes.
ZINC ZIRCONIUM SILICATE* ZnZrSiO ₅	An opacifier which gives brilliance to the color of a glaze. Usually combined with other zircon compounds.
ZIRCON, G MILLED* ZrSiO ₄	An opacifier which controls texture and craze resistance in glazes.
ZIRCOPAX PLUS* ZrSiO ₄	A very effective zirconium glaze opacifier. Equivalent to Ultrox Extra. Replaced regular Zircopax and Superpax which are no longer available.

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