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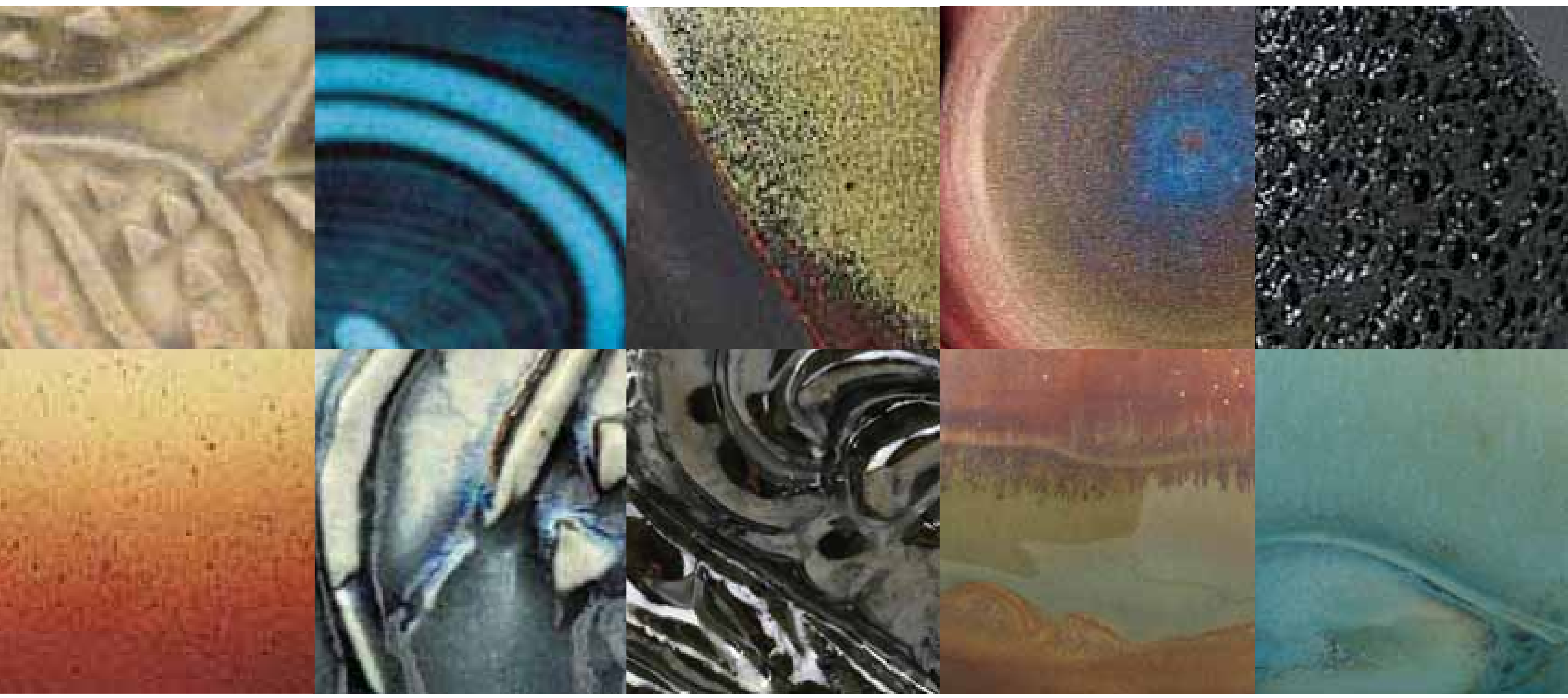
15 tried & true cone 6 glaze recipes



recipes and testing procedures for our favorite mid-range pottery glazes

15 Tried & True Low Fire Glaze Recipes

Good news cone 6 potters! We've gathered some of our favorite cone 6 glaze recipes in a convenient recipe-card format, perfect for printing and taking to the pottery studio. If you are interested in building a collection of beautiful cone 6 pottery glazes, you've found the perfect resource. If you've been low firing and would like to turn up the heat a bit, here's a great assortment of cone 6 glaze recipes to start with. Or if you have grown bored with your current glazes, try out a few of these.

And remember, as with all things ceramic: results may vary! Use the beautiful images here as a guide to the surfaces you'll get, but be sure to always start out with small batches and have fun testing and tweaking. Now get out there and mix up some new pottery glazes.

How to Test Cone 6 Glaze Recipes for Color Response and Surface Texture

by Yoko Sekino-Bové

There are so many wonderful books, websites and even software that feature spectacular glaze formulas; so one may wonder why this article should be introduced to you. The focus of this research was to establish a comprehensive visual library for everyone. Rather than just providing the reader with a few promising glaze formulas, this reference is a guideline. Because it is a guide, there are some test tiles that do not provide immediate use other than the suggestion of what to avoid, or the percentages of certain chemicals that exceed the safe food-serving level, etc., but I believe that this research will be a good tool for those who wish to experiment with, and push the boundaries of, mid-range firing.

Many people may be thinking about switching their firing method from high-fire to mid-range. For instance, students who recently graduated and lost access to school gas kilns, people with a day job and those who work in their garage studios, or production potters who are concerned about fuel conservation and energy savings. This reference is intended as a tool for those people to start glaze experimentations at mid-range that can be accomplished with minimal resources.

There is no guarantee that this chart will work for everyone everywhere, since the variety between the different resources overwhelmingly affects the results, but by examining a few glazes in this chart you can speculate and make informed adjustments with your materials. This is why all the base glazes for this research use only simple materials that are widely available in the US.

Five years ago, when I was forced to switch to mid-range oxidation firing with an electric kiln, from gas-fueled reduction firing at high temperatures, most of my hard-earned knowledge in high-fire glazes had to be re-examined. Much to my frustration, many earth metal colorants exhibited completely different behaviors in oxidation firing. Also, problems in adhesion were prominent compared to high-fire glazes.

The role of oxides and carbonates used for texturing and opacifying were different as well. But compiling the available glazes and analyzing them were not enough. I felt there should be a simple chart with visual results that explained how the oxides and carbonates behave within this firing range. This motivated me to write a proposal for glaze mid-range research to the McKnight Foundation, which generously sponsors a

recipes

N501 TRANSPARENT, GLOSSY, AND CRACKLES
Cone 5

Ferro Frit 3110	90	%
EPK Kaolin	10	
	100	%

N502 TRANSPARENT AND GLOSSY
Cone 5

Gillespie Borate	30	%
F-4 Feldspar	46	
EPK Kaolin	13	
Silica	11	
	100	%

See chart on page 50 for test results.

N503 OPAQUE, GLOSSY, AND TEXTURED
Cone 5

Gillespie Borate	52.6	%
EPK Kaolin	21.0	
Silica	26.4	
	100.0	%
Add: Zircopax	10.0	%

N504 SEMI-OPAQUE, SEMI-SATIN WITH TEXTURES
Cone 5

Whiting	9.5	%
Ferro Frit 3124	44.5	
F-4 Feldspar	20.0	
Zinc Oxide	5.5	
Bentonite*	7.5	
EPK Kaolin	5.0	
Silica	8.0	
	100.0	%
Add: Zircopax	9.0	%

See chart on page 50 for test results.

* Bentonite is typically listed as an addition to recipes, but in larger amounts it contributes appreciably to the amount of alumina and silica in the recipe and is therefore included along with the clays in the list of the main ingredients.

N505 SATIN, OPAQUE WITH TEXTURES
Cone 5

Dolomite	12	%
Gillespie Borate	14	
Wollastonite	10	
Ferro Frit 3124	8	
Cornwall Stone	46	
EPK Kaolin	10	
	100	%
Add: Magnesium Carbonate	6	%

While the test results with all colorant options are shown for two recipes in this article, charts showing all of the test results for all of the recipes listed here are available at www.ceramicsmonthly.org. Click the "CM Master Class" link on the right side of the page to see the "Expanding your Palette" post and all of the research.

Glaze base N501 with coloring oxides and carbonates

	0.1%	0.5%	1.0%	5.0%	10.0%
Copper Carbonate		N501CC05	N501CC10	N501CC50	N501CC100
Red Iron Oxide (regular)		N501ROI05	N501ROI10	N501ROI50	N501ROI100
Cobalt Oxide	N501COX01	N501COX05	N501COX10		
Chrome Oxide	N501CH01	N501CH05	N501CH10		
Manganese Dioxide		N501MD05	N501MD10	N501MD50	N501MD100
Black Nickel Oxide		N501BN05	N501BN10	N501BN50	
Iron Chromate		N501IC05	N501IC10	N501IC50	N501IC100
Rutile (powder)		N501R05	N501R10	N501R5	N501R100
Yellow Ochre		N501Y05	N501Y10	N501Y50	N501Y100

Glaze base N502 with coloring oxides and carbonates

	0.1%	0.5%	1.0%	5.0%	10.0%
Copper Carbonate		N502CC05	N502CC10	N502CC50	N502CC100
Red Iron Oxide (regular)		N502ROI05	N502ROI10	N502ROI50	N502ROI100
Cobalt Oxide	N502COX0	N502COX05	N502COX10		
Chrome Oxide	N502CH01	N502CH05	N502CH10		
Manganese Dioxide		N502MD05	N502MD10	N502MD50	N502MD100
Black Nickel Oxide		N502BN05	N502BN10	N502BN50	
Iron Chromate		N502IC05	N502IC10	N502IC50	N502IC100
Rutile (powder)		N502R05	N502R10	N502R5	N502R100
Yellow Ochre		N502Y05	N502Y10	N502Y50	N502Y100

Glaze base N503 with coloring oxides and carbonates

	0.1%	0.5%	1.0%	5.0%	10.0%
Copper Carbonate		N503CC05	N503CC10	N503CC50	N503CC100
Red Iron Oxide (regular)		N503ROI05	N503ROI10	N503ROI50	N503ROI100
Cobalt Oxide	N503COX01	N503COX05	N503COX10		
Chrome Oxide	N503CH01	N503CH05	N503CH10		
Manganese Dioxide		N503MD05	N503MD10	N503MD50	N503MD100
Black Nickel Oxide		N503BN05	N503BN10	N503BN50	
Iron Chromate		N503IC05	N503IC10	N503IC50	N503IC100
Rutile (powder)		N503R05	N503R10	N503R5	N503R100
Yellow Ochre		N503Y05	N503Y10	N503Y50	N503Y100

Glaze base N504 with coloring oxides and carbonates

	0.1%	0.5%	1.0%	5.0%	10.0%
Copper Carbonate		N504CC05	N504CC10	N504CC50	N504CC100
Red Iron Oxide (regular)		N504ROI05	N504ROI10	N504ROI50	N504ROI100
Cobalt Oxide	N504COX01	N504COX05	N504COX10		
Chrome Oxide	N504CH01	N504CH05	N504CH10		
Manganese Dioxide		N504MD05	N504MD10	N504MD50	N504MD100
Black Nickel Oxide		N504BN05	N504BN10	N504BN50	
Iron Chromate		N504IC05	N504IC10	N504IC50	N504IC100
Rutile (powder)		N504R05	N504R10	N504R50	N504R100
Yellow Ochre		N504Y05	N504Y10	N504Y50	N504Y100

Glaze base N505 with coloring oxides and carbonates

	0.1%	0.5%	1.0%	5.0%	10.0%
Copper Carbonate		N505CC05	N505CC10	N505CC50	N505CC100
Red Iron Oxide (regular)		N505ROI05	N505ROI10	N505ROI50	N505ROI100
Cobalt Oxide	N505COX0	N505COX05	N505COX10		
Chrome Oxide	N505CH01	N505CH05	N505CH10		
Manganese Dioxide		N505MD05	N505MD10	N505MD50	N505MD100
Black Nickel Oxide		N505BN05	N505BN10	N505BN50	
Iron Chromate		N505IC05	N505IC10	N505IC50	N505IC100
Rutile (powder)		N505R05	N505R10	N505R5	N505R100
Yellow Ochre		N505Y05	N505Y10	N505Y50	N505Y100

Glaze Base N502 with Opacifiers/ Texture Metals

	1.0%	5.0%	10.0%
Tin Oxide	N502CT10	N502CT50	N502CT100
Titanium Dioxide	N502CTD10	N502CTD50	N502CTD100
Magnesium Carbonate	N502CMC10	N502CMC10	N502CMC10
Lithium Carbonate	N502CL10	N502CL10	N502CL10
Strontium Carbonate	N502CS10	N502CS10	N502CS10
Zinc Oxide	N502CTD10	N502CTD10	N502CTD10
Zircopax	N502CZ10	N502CZ50	N502CZ100

Opacifiers were added to glaze base N502 in increments. The chart above shows which materials were added for this purpose, and the percentages tested. All glazes in this test batch also had 1% copper carbonate added to increase the visual effect of the chemicals on the glaze.

Note: Some of the oxides and carbonates did not exhibit a significant visual effect by themselves. However, sometimes a combination of more than one chemical can change the glaze characteristics and create spectacular visual effects.

three-month artist-in-residence program at the Northern Clay Center in Minneapolis, Minnesota.

Most of the tests presented in these experiments were executed at the Northern Clay Center from October to December in 2009 using clay and dry materials available at Continental Clay Co. The rest of the tests were completed after my residency at my home studio in Washington, Pennsylvania. For those tests, I used dry materials available from Standard Ceramics Supply Co.

Test Conditions

Clay body: Super White (cone 5–9) a white stoneware body for mid-range, commercially available from Continental Clay Co.

Bisque firing temperatures: Cone 05 (1910°F, 1043°C), fired in a manual electric kiln for approximately 10 hours.

Glaze firing temperatures: The coloring metals increment tests (page 50) were fired to cone 5 (2210°F, 1210°C) in a manual electric kiln for approximately 8 hours. The opacifier/texture metals increment tests (page 51) were fired to cone 5 in an automatic electric kiln for 8 hours.

Glaze batch: Each test was 300g, with a tablespoon of epsom salts added as a flocculant.

Glazing method: Hand dipping. First dip (bottom half): 3 seconds. Second dip (top half) additional 4 seconds on top of the first layer, total 7 seconds.

Coloring Metals Increment Chart

The following colorants were tested: black nickel oxide, cobalt oxide, copper carbonate, chrome oxide, iron chromate, manganese dioxide, red iron oxide, rutile, and yellow ochre. You should note that tests with cobalt oxide and chrome oxide in high percentages were not executed due to the color predictability. Other blank tiles on the chart are because either the predictability or the percentages of oxides are too insignificant to affect the base glazes.

Depending on firing atmospheres, manganese dioxide exhibits a wide variety of colors. When fired in a tightly sealed electric kiln with small peepholes, the glaze color tends toward brown, compared to purple when fired in a kiln with many and/or large peepholes.

Please note that some of the oxides and carbonates in this test exceed the safety standard for use as tableware that comes in contact with food. Check safety standards before applying a glaze with a high percentage of metal oxides to food ware and test the finished ware for leaching.

Test tile numbering system: The glaze name is the first part of the identification number, followed by an abbreviation or code that stands for the colorant name. The last part is a two or three digit number referring to the percentage of colorant added.

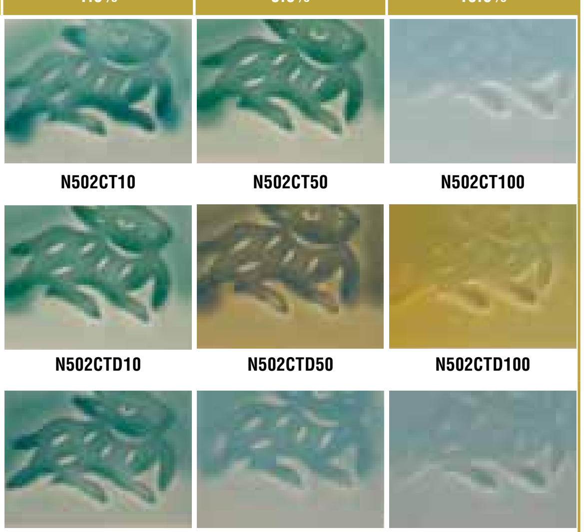
So, for example if a test was mixed with glaze base N501, to which 1 percent cobalt oxide was added, the test tile marking would be: N501COX10.

Conclusion

This group of tests has been a great opportunity for me to study the characteristics of oxides and carbonates and how they behave at mid-range temperatures. There are scientific methods for calculating glazes and proven theories, but there are many small pieces of information that can only be picked up when you actually go through the physical experiments. It is important for us to become familiar with a glaze's behavior so that we can better utilize it. Key to that is learning both the theory and application. It is my hope that these tests will benefit many potters by helping them to expand their palette and inspire them to test the possibilities.

the author Yoko Sekino-Bové is an artist living in Washington, Pennsylvania. *She would like to thank the McKnight Foundation and the Northern Clay Center and its supporting staff for making this research possible.*

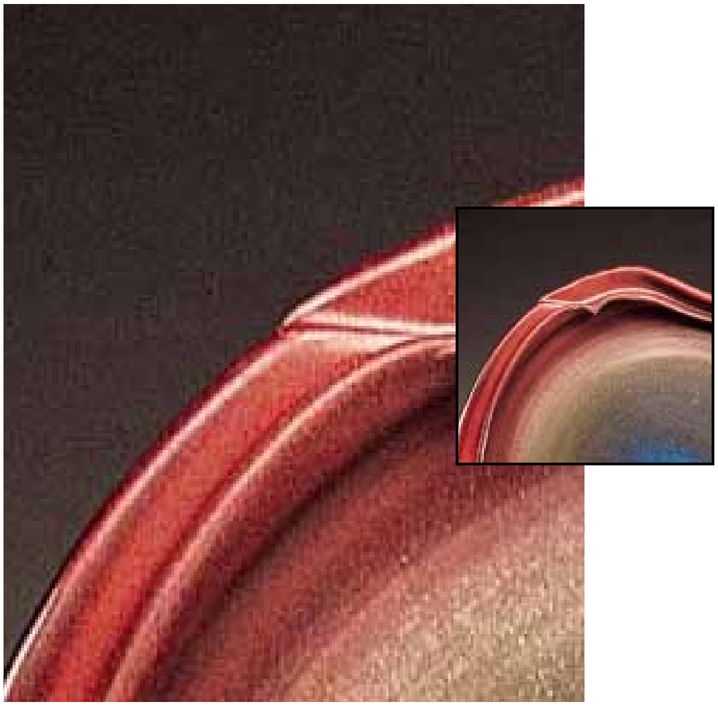
Glaze Base N502 with Opacifiers



	1.0%	5.0%	10.0%
Tin Oxide	N502CT10	N502CT50	N502CT100
Titanium Dioxide	N502CTD10	N502CTD50	N502CTD100
Zircopax	N502CZ10	N502CZ50	N502CZ100

Opacifiers were added to glaze base N502 in increments. The chart at left shows which materials were added for this purpose, and the percentages tested. All glazes in this test batch also had 1% copper carbonate added to increase the visual effect of the chemicals on the glaze.

Note: Some of the oxides and carbonates did not exhibit a significant visual effect by themselves. However, sometimes a combination of more than one chemical can change the glaze characteristics and create spectacular visual effects.



Blue-Green / Copper Red Glaze

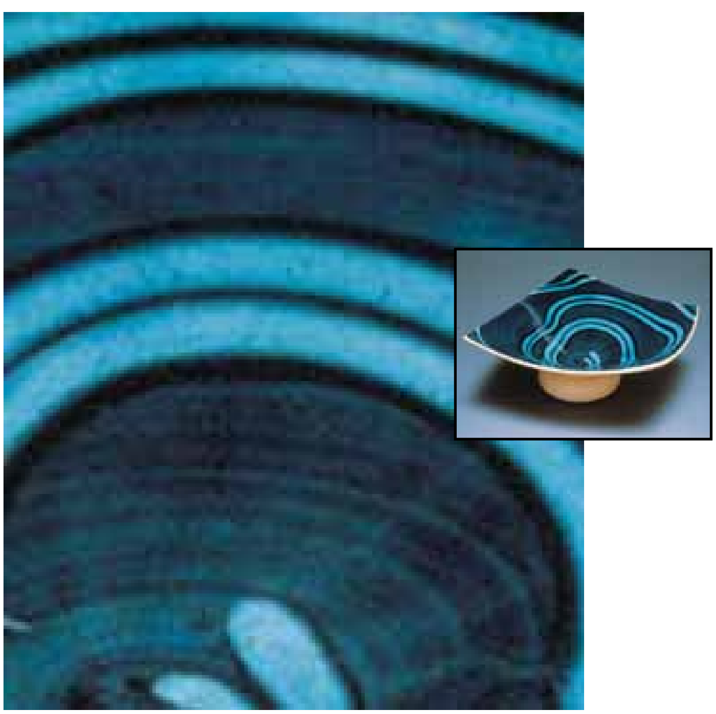
(Cone 6, oxidation or reduction)

Talc	3.30	%
Whiting	14.29	
Ferro Frit 3134	13.33	
Kona F-4 Feldspar	46.16	
EPK Kaolin	6.40	
Silica	16.52	
	100.00	%
Add: Tin Oxide	2.24	%
Zinc Oxide	4.37	%
Black Copper Oxide	1.07	%

Covering with clear glaze helps reduce burning out of red.

From Rick Malmgren, *Ceramics Monthly*, October 2000

Cone 6



Wright's Water Blue Glaze

(Cone 1–6, oxidation)

Lithium Carbonate	3	%
Strontium Carbonate	9	
Ferro Frit 3110	59	
EPK Kaolin	12	
Silica	17	
	100	%
Add: Bentonite	2	%
Copper Carbonate	5	%

From David Wright, *Ceramics Monthly*, April 1998

Cone 6

BLAIR'S BROWN BODY

(Cone 6 Oxidation)

Red Art	60%
Gold Art	15
OM4 Ball Clay	15
Silica	10
	100%

This clay body is made without sand or grog, allowing it to be worked in the same way as a smooth porcelain body.

BASIC BRONZE

(Cone 6 Oxidation)

Red Art	60%
Gerstley Borate	30
OM4 Ball Clay	5
Silica	5
	100%
Add: Manganese Dioxide	45%
Copper Carbonate	5%

Note: This glaze is not food safe. When firing manganese dioxide, take extra precaution to avoid breathing kiln fumes, as they will be toxic.

Fake Ash

(Cone 6, reduction)

Bone Ash	5 %
Dolomite	25
Lithium Carbonate	2
Strontium Carbonate	9
Ferro Frit 3134	10
Kentucky Ball Clay (OM#4)	24
Cedar Heights Redart	23
Silica	2
	100 %

This is a beautifully variegated fake ash glaze. It is a brighter yellow on porcelain with hints of green where thicker and terra cotta-colored where thin. It is not stable because it is low in silica, but to alter it would change the ash effect. While it does not meet strict requirements of stability, I use it anyway because I substituted strontium for barium.

From Diana Pancioli,
Ceramics Monthly, June 2006

STRONTIUM CRYSTAL MAGIC—WARM

Cone 6

Lithium Carbonate	4.5 %
Strontium Carbonate	12.6
Whiting	17.3
Ferro Frit 3124	4.5
Custer Feldspar	45.9
EPK Kaolin	15.2
	100.0 %
Add: Titanium Dioxide	13.8 %
Yellow Iron Oxide	2.8 %
Bentonite	2.3 %

Combine with iron-saturated glazes for rich earth tones.

Cone 6

STRONTIUM CRYSTAL MAGIC—COOL

Cone 6

Lithium Carbonate	4.6 %
Strontium Carbonate	12.6
Whiting	17.2
Ferro Frit 3124	4.6
Custer Feldspar	46.0
EPK Kaolin	15.0
	100.0 %
Add: Titanium Dioxide	12.0 %
Bentonite	2.0 %

Combine with glazes containing either copper or cobalt to develop icy colors.

Cone 6

Temmoku Glaze

(Cone 6, reduction)

Whiting	20	%
Custer Feldspar	35	
Kentucky Ball Clay (OM#4)	15	
Silica	30	
	100	%
Add: Red Iron Oxide	10	%

A cone 10 that works equally well at cone 6; yields yellow "tea dust" crystals in reduction. Not as interesting in oxidation; just lies there and looks brown.

From Rick Malmgren,
Ceramics Monthly, October 2000

Cone 6

Marilee's Lava Glaze

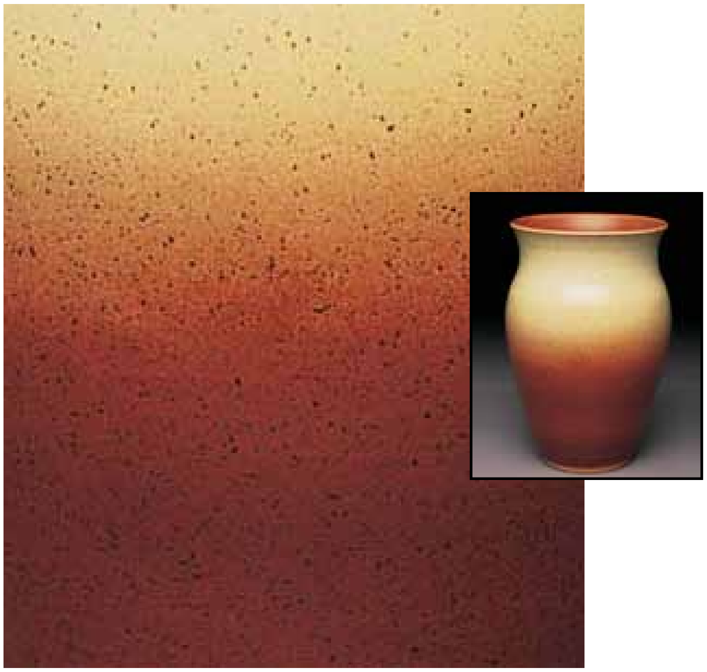
(Cone 6, oxidation or reduction)

Whiting	23.91	%
Custer Feldspar	49.73	
EPK Kaolin	13.18	
Silica	13.18	
	100.00	%
Add: Titanium Dioxide	11.29	%
Silicon Carbide	3.4	%

A Very rough glaze; not intended for food surfaces. Fine silicon carbide seems to work best. For a gray to black variation, add 7% Mason stain 6600.

From Rick Malmgren,
Ceramics Monthly, October 2000

Cone 6

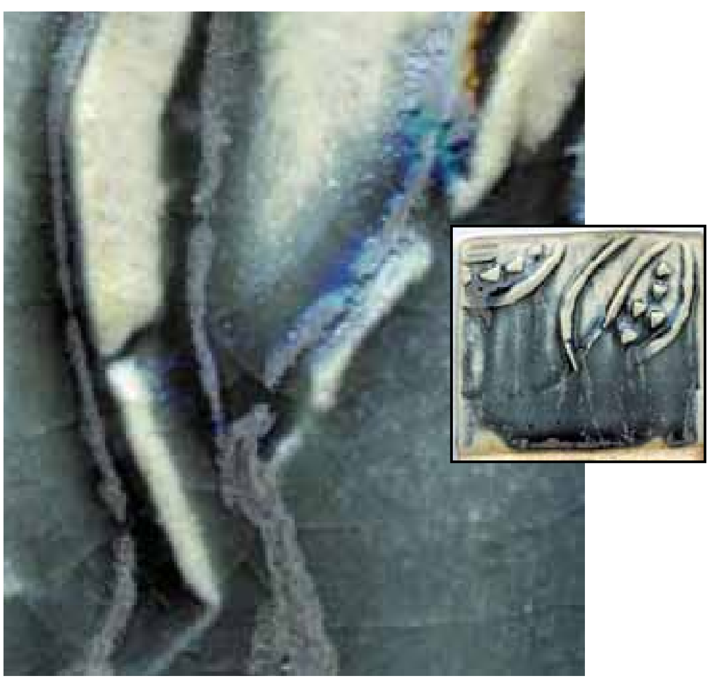


Eggshell Glaze

(Cone 6, oxidation)

Whiting	9.5%
Zinc Oxide	5.5
Ferro Frit 3124	44.5
Custer Feldspar	20.0
Bentonite	7.5
EPK Kaolin	5.0
Silica	8.0
	100.0 %
Add: Tin Oxide	9.0 %
Red Iron Oxide	3.0 %

From Central Carolina Community College,
Ceramics Monthly, October 2004



Textured Blue

(Cone 6, reduction)

Talc	17.0 %
Whiting	10.0
Ferro Frit 3134	20.0
Nepheline Syenite	30.0
EPK Kaolin	13.0
Silica	10.0
	100.0 %
Add: Zircopax	10.0 %
Cobalt Carbonate	0.5 %
Copper Carbonate	1.0 %
Rutile	3.0 %

This is Marcia Selsor's Waxy White base with a number of colorants added. This variation was derived from a 50/50 color blend with rutile incorporated in the base for texture. Goes glossy on interiors and breaks beautifully over textures.

From Diana Pancioli,
Ceramics Monthly, June 2006