Gerry Zucca Sabbatical Report , Fall 2018 sabbatical

Investigation Into Possible

Cone 6 Crystalline Process

Gerry Zucca, Cone 6 Crystallin Vase, Glaze is Green Marble, Fall 2018

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Content:

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1. Objective:

My objective is to research and develop Cone 6 Crystalline base glazes and firing processes. Formulated glazes and processes are intended to be used by students and instructors in Moorpark College ceramics, glaze design, sculpture, 3D design, and similar courses at the other district colleges, me.

The idea of developing Cone 6 crystalline is relatively new. There is little information on this process. Developing, Cone 6, crystalline process, at Moorpark College would have us leading the way in a new exciting area of ceramics. This lower temperature process will make crystalline affordable and accessible to our students and the community.

Gerry Zucca, Cone 6 Crystallin Vase, Glaze is Milk Coffee, Fall 2018

2. Results:

1. Yes it is possible to produce Cone 6 crystalline glazes with spectacular results.
2. Five cone 6 crystalline base glazes were successfully created.
3. Fourteen cone 6 crystalline glazes were formulated and tested.
4. Firing process for cone 6 crystalline was developed and optimized through approximately 40 firings.

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3. Formulated and Tested Cone 6 Base Crystalline Glazes

The five successful base glazes that were developed started out as known good cone 10 crystalline glazes that were altered to melt a cone 6. After some amount of experimentation with different levels of fluxes (frits), silica, titanium dioxide and zinc oxide, these four base glazes showed good crystals. More than one base glaze is necessary in order to have greater diversity in glaze colors and crystal growth. Base glazes with the same colorants will vary in color due to the differences in fluxes within the base glazes.

Cone 6 base glaze formulas:

C6H11 base		**x30**	**x40**	**x50**
Ferro Frit 3110	50.90	1527.0	2036.0	2545.0
Zinc Oxide	24.50	735.0	980.0	1225.0
Silica	17.30	519.0	692.0	865.0
Titanium Dioxide	4.50	135.0	180.0	225.0
Bentonite	1.80	54.0	72.0	90.0
CMC	1.00	30.0	40.0	50.0
	0.00	0.0	0.0	0.0
total grams	100.00	3000.0	4000.0	5000.0

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C6H12 base		**x30**	**x40**	**x50**
Ferro Frit 3110	53.80	1614.0	2152.0	2690.0
Zinc Oxide	26.00	780.0	1040.0	1300.0
Silica	12.50	375.0	500.0	625.0
Titanium Dioxide	4.80	144.0	192.0	240.0
Bentonite	1.90	57.0	76.0	95.0
CMC	1.00	30.0	40.0	50.0
	0.00	0.0	0.0	0.0
total grams	100.00	3000.0	4000.0	5000.0

C6H13 base		**x30**	**x40**	**x50**
Ferro Frit 3110	60.00	1800.0	2400.0	3000.0
Zinc Oxide	24.50	735.0	980.0	1225.0
Silica	14.00	420.0	560.0	700.0
Titanium Dioxide	4.50	135.0	180.0	225.0
Bentonite	1.80	54.0	72.0	90.0
CMC	1.00	30.0	40.0	50.0
	0.00	0.0	0.0	0.0
total grams	105.80	3174.00	4232.00	5290.00

C6A10 base		**x30**	**x40**	**x50**
Ferro Frit 3110	63.50	1905.0	2540.0	3175.0
Zinc Oxide	25.80	774.0	1032.0	1290.0
Silica	8.60	258.0	344.0	430.0
Kaolin - EPK	1.10	33.0	44.0	55.0
CMC	1.00	30.0	40.0	50.0
	0.00	0.0	0.0	0.0
total grams	100.00	3000.0	4000.0	5000.0

C6SnairAlt base		**x30**	**x40**	**x50**
Ferro Frit 3110	45.60	1368.0	1824.0	2280.0
Zinc Oxide	23.00	690.0	920.0	1150.0
Silica	16.90	507.0	676.0	845.0
Kaolin - Calcined	1.40	42.0	56.0	70.0
Lithium Carbonate	4.80	144.0	192.0	240.0
Titanium Dioxide	7.30	219.0	292.0	365.0
CMC	1.00	30.0	40.0	50.0
	0.00	0.0	0.0	0.0

4. Formulated and Tested Cone 6 Crystalline Glazes

Note: The glaze names were created to be fun and descriptive, kind of like ice cream flavors. For example, "Lemon Ice" is the name for the glaze that is yellow but has blue white crystals.

Blue Bell

C6SnairAlt base	
Ferro Frit 3110	45.60
Zinc Oxide	23.00
Silica	16.90
Kaolin - Calcined	1.40
Lithium Carbonate	4.80
Titanium Dioxide	7.30
CMC	1.00
Copper Oxide	0.50
Cobalt Carbonate	0.10
Potassium Carbonate	1.00
total grams	101.60

Blue Olive

C6H11 base	
Ferro Frit 3110	50.90
Zinc Oxide	24.50
Silica	17.30
Titanium Dioxide	4.50
Bentonite	1.80
CMC	1.00
Cobalt Carbonate	2.00
Potassium Carbonate	1.00
total grams	103.00

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Blue Marble

C6H11 base	
Zinc Oxide	24.50
Silica	17.30
Titanium Dioxide	4.50
Bentonite	1.80
CMC	1.00
Cobalt Oxide	0.50
Iron Oxide - Black	1.00
total grams	101.50

Desert Rose

C6H13	
Ferro Frit 3110	60.00
Zinc Oxide	24.50
Silica	14.00
Titanium Dioxide	4.50
Bentonite	1.80
CMC	1.00
Manganese Dioxide	5.00
Tin Oxide	2.00
Copper Carbonate	0.10
Cobalt Carbonate	0.10
total grams	113.00

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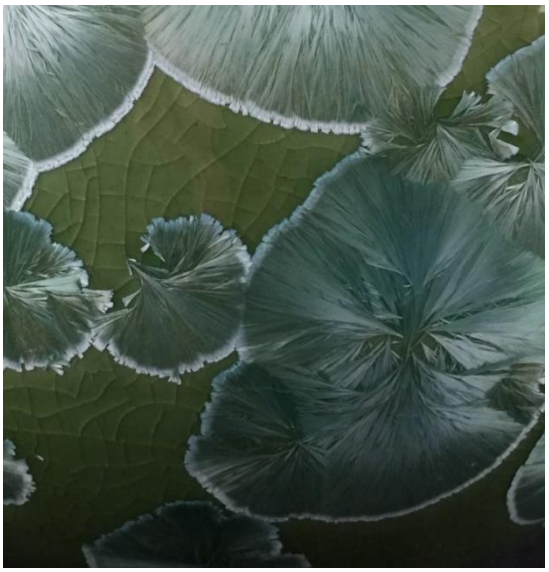
Green Marble



C6H11 base	
Ferro Frit 3110	50.90
Zinc Oxide	24.50
Silica	17.30
Titanium Dioxide	4.50
Bentonite	1.80
CMC	1.00
Copper Carbonate	3.00
Titanium Dioxide	3.00
total grams	106.00

Lemon Drop

C6H11 base	
Ferro Frit 3110	50.90
Zinc Oxide	24.50
Silica	17.30
Titanium Dioxide	4.50
Bentonite	0.50
CMC	1.00
Rutile	4.00
total grams	102.70

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Lemon Ice

C6H11 base	
Ferro Frit 3110	50.90
Zinc Oxide	24.50
Silica	17.30
Titanium Dioxide	4.50
Bentonite	1.80
CMC	1.00
Rutile	3.00
Cobalt Carbonate	0.30
total grams	103.30

Sapphire

C6H11 base	
Ferro Frit 3110	50.90
Zinc Oxide	24.50
Silica	17.30
Titanium Dioxide	4.50
Bentonite	1.80
CMC	1.00
Cobalt Carbonate	2.00
total grams	102.00

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Milk Coffee

Ferro Frit 3110	52.60
Zinc Oxide	25.30
Silica	14.50
Titanium Dioxide	4.70
Bentonite	1.90
CMC	1.00
Manganese Dioxide	3.00
Rutile	2.00
total grams	105.00

Mint Green

C6H12 base	
Ferro Frit 3110	53.80
Zinc Oxide	26.00
Silica	12.50
Titanium Dioxide	4.80
Bentonite	1.90
CMC	1.00
Copper Carbonate	3.00
Titanium Dioxide	3.00
total grams	106.00

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Snake Skin

C6H11 base	
Ferro Frit 3110	50.90
Zinc Oxide	24.50
Silica	17.30
Titanium Dioxide	4.50
Bentonite	1.80
CMC	1.00
Copper Carbonate	3.00
Titanium Dioxide	8.00
total grams	111.00

Snow Flake

C6H11 base, less bentonite	
Ferro Frit 3110	50.90
Zinc Oxide	24.50
Silica	17.30
Titanium Dioxide	4.50
Bentonite	0.50
CMC	1.00
	0.00
total grams	98.70

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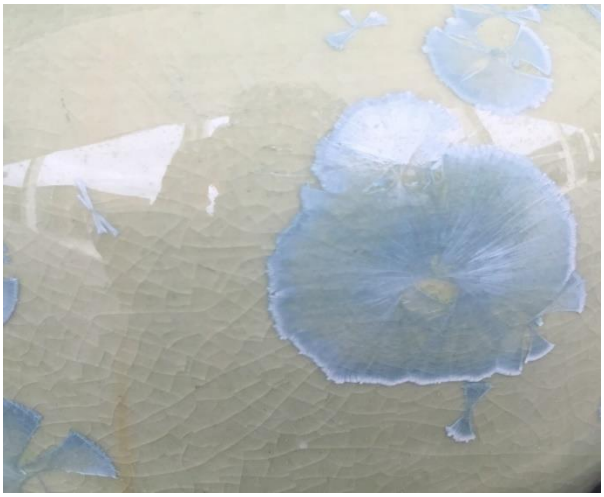
Spring Green



C6SnairAlt base	
Ferro Frit 3110	45.60
Zinc Oxide	23.00
Silica	16.90
Kaolin - Calcined	1.40
Lithium Carbonate	4.80
Titanium Dioxide	7.30
CMC	1.00
Copper Oxide	0.50
Cobalt Carbonate	0.10
total grams	100.60

Teal Green

C6H11 base	
Ferro Frit 3110	50.90
Zinc Oxide	24.50
Silica	17.30
Titanium Dioxide	4.50
Bentonite	1.80
CMC	1.00
Copper Carbonate	3.00
Titanium Dioxide	3.00
Cobalt Carbonate	0.10
total grams	106.10

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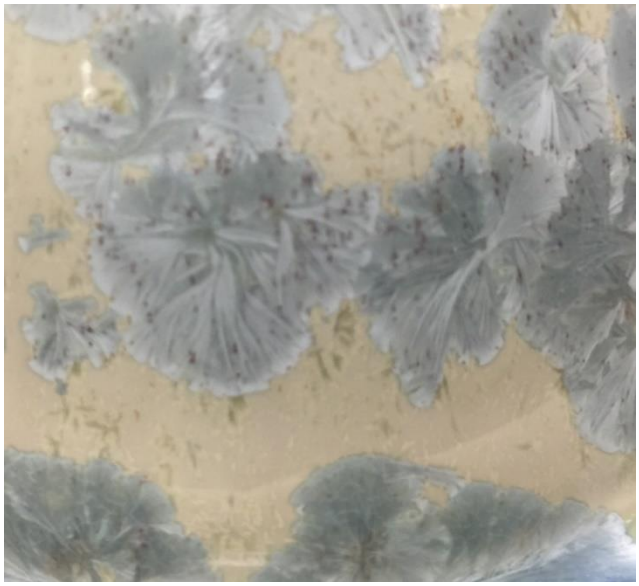
Sage



C6SnairAlt base	
Ferro Frit 3110	45.60
Zinc Oxide	23.00
Silica	16.90
Kaolin - Calcined	1.40
Lithium Carbonate	4.80
Titanium Dioxide	7.30
CMC	1.00
Copper Oxide- Black	1.00
Iron Oxide - Red	1.00
Cobalt Carbonate	0.10
total grams	102.10

Topaz

Ferro Frit 3110	59.00
Zinc Oxide	25.80
Silica	8.60
Kaolin - EPK	1.10
CMC	1.00
Nickel Oxide	3.00
total grams	98.50

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Tuscan Green

C6H12 base	
Ferro Frit 3110	53.80
Zinc Oxide	26.00
Silica	12.50
Titanium Dioxide	4.80
Bentonite	1.90
CMC	1.00
Copper Oxide	1.00
Iron Oxide - Black	2.00
total grams	103.00

5. Cone 6 Firing Process/Schedule

Through a long process of experimentation, the optimal cone 6 crystalline growing temperature was found to be between 1870 ˚F and 1835 ˚F. This is about 100 ˚F lower than the crystal growing temperature for cone 10. The firing schedule used has three different 1 hour hold times to maximize crystal growth and hopefully create crystal growth rings.

“Latest and greatest “Ramp and Hold program used in our electric kilns

1	2000	250	0.00	Crystalline
2	2220	200	0.25	good crystals
3	1865	750	1.00	nice rings
4	1845	20	1.00	round
5	1855	20	1.00	

6. Conclusion and Further Studies

The cone 6 crystalline process is a viable process that can render beautiful results. The cost saving in energy use and kiln element ware makes this process affordable for our program at Moorpark College. The results from this investigation are a starting point for further study into new base glazes, more complex color development, and improving the firing schedule to yield larger crystals with growth rings.

The findings from this sabbatical exploration have been shared will the art faculty at Moorpark College. Cone 6 crystalline has been integrated into the ceramics curriculum. Cone 6 crystalline is now being used in our Moorpark College Art courses. Students are very happy and excited about this new opportunity to explore a new process. The students will be helping in the experimentation and development of new crystalline glazes.