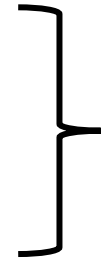


Schematics for Ease of Application

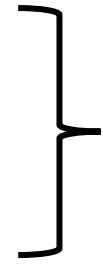
Enamel Color Mix

- 5 parts Lumin
- 1 part Linen
- .5-.75 part Snow



Standard Type Enamel (58-59 range)
(reduce Snow content dramatically for greyer enamel)

- 5 parts Lumin
- 1 part Linen
- .75-1 part Snow



Bleach Type Enamel



Posteriors

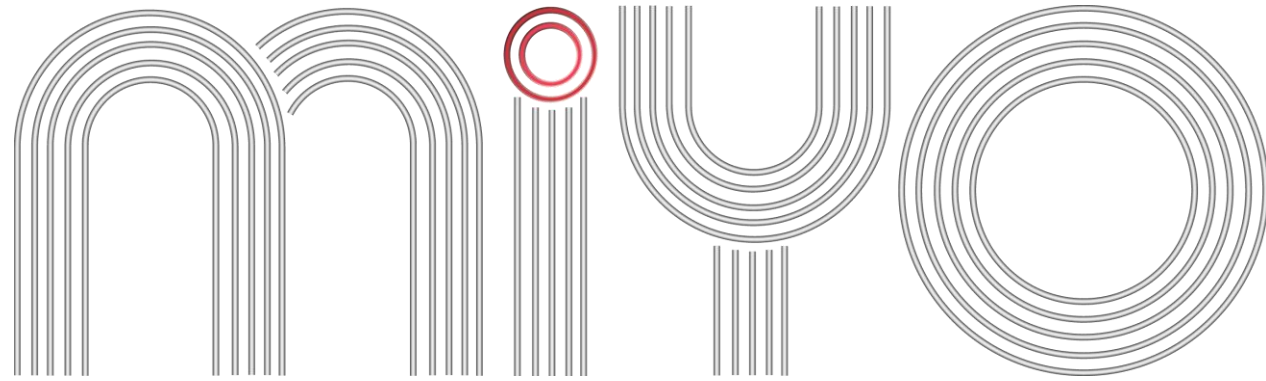


Posteriors



Anteriors





Important Points to Remember

Differences between MiYO Colors and Structure, from a handling standpoint

- **MiYO colors** need to be the correct thickness/viscosity to apply easily
 - They are stirred prior to dispensing to check viscosity and homogenize color particle suspension
 - They can only be mixed with InSync glaze liquid, **NOT** water!
- **MiYO Structure** should be a totally different consistency from the colors
 - Structure should NOT be stirred, but 'patted' (shear thinning) to bring a homogenous moisture dispersion
 - Structure, if it becomes too dry, needs to have InSync glaze liquid applied and let to soak in. Then shear thinning can be applied to ensure dispersion.
 - Small amounts of water in your brush can be used to manipulate/smooth the Structure on your restoration, since WYSIWYG is not necessary....unlike the colors

What Works Best...

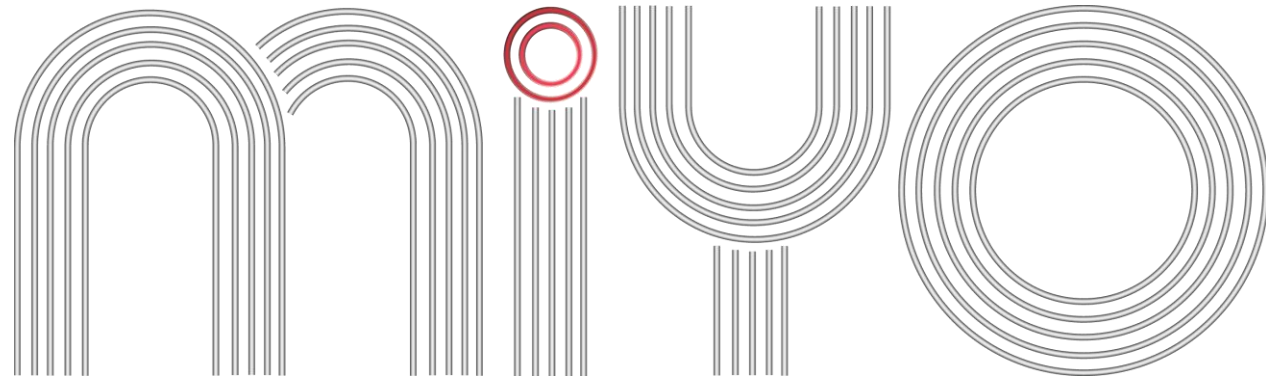


- Keep your MiYO colors mixed (please)
 - Dispensing what you need daily (for best handling characteristics)
 - Mixing your material for approximately 4-6 seconds (minimum) prior to dispensing
 - Ensures even color distribution (ensuring WYSIWYG)
 - Enhances viscosity or allows you to adjust if necessary
 - Only use InSync Glaze Liquid with MiYO colors
 - Use sparingly (DO NOT get your colors too thin!)
 - Insures proper refractive index is maintained for WYSIWYG
- **REMEMBER!!!** Start off with a clean framework! **ALSO!!!** Start off with clean hands (*if* you will be handling the restoration), which means washing with soap and water

Don't Rush Drying or Cooling

- The primary reason for prolonged drying or cooling is **NOT** the MiYO application, but the *thermal conductivity of the framework*
- Thicker viscosities require more careful drying than thinner mixes
- Rushing the drying process can produce pits or bubbles
- Rushing the cooling process can cause the framework to crack (normally most critical in areas of greater mass/thickness)

“WE NEVER HAVE ENOUGH TIME TO DO IT RIGHT, BUT WE ALWAYS
HAVE TIME TO REMAKE IT”



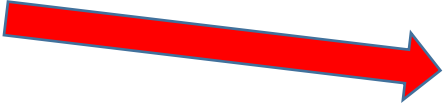
Proper Drying, Firing and Cooling Considerations

TOPICS

- LOW TEMPERATURE AND BOILING POINT OF LIQUIDS
- CONDUCTIVITY OF MATERIALS PRE-DRY & CLOSING TIME
- HEAT OR 'RAMP' RATES
- HIGH TEMPERATURE DETERMINANTS
- HOLD TIMES AT HIGH TEMPERATURE
- COOLING CONSIDERATIONS

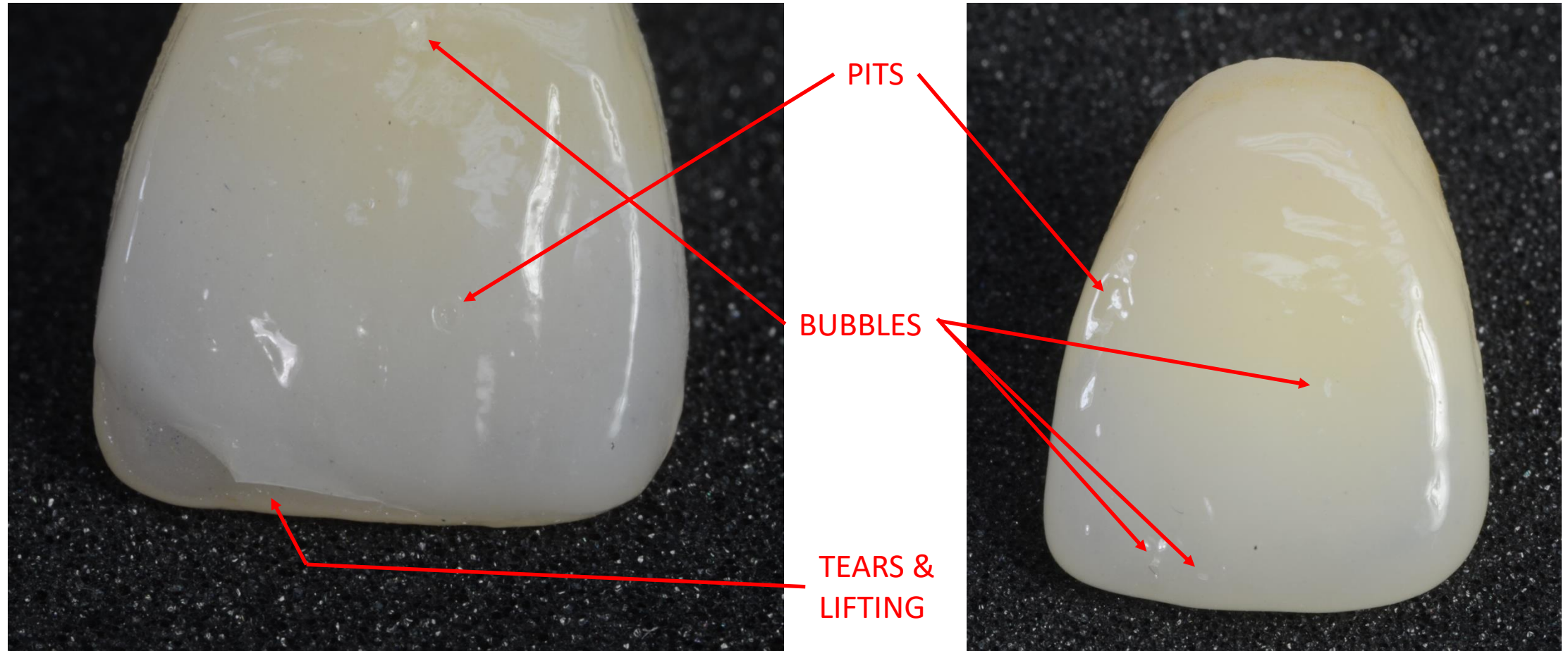
LOW TEMPERATURE AND BOILING POINT OF LIQUIDS

- THE LIQUID IN MiYO AND INSYNC GLAZE LIQUID **BOIL** AT:
 - **200-220C**
 - **392-428F**
 - LOW TEMPERATURE SETTING NEEDS TO BE ADJUSTED LOW ENOUGH FOR PARTICULAR OVEN TO **NOT** BOIL ANY LIQUIDS PRIOR TO DRYING
 - BOILING CAUSES 'POCK MARKS' (PORES) OR INTERNAL BUBBLES IN MiYO
 - PRE-DRY TIME AND CLOSURE TIMES ARE VERY IMPORTANT FOR GENTLE DRYING
 - DISTANCE FROM RESTORATIONS TO HEAT SOURCE (AND ANGLE) ARE IMPORTANT TO NOT DRY TOO RAPIDLY
-
- **e.Max & LiSi** RESPOND BETTER TO LOW TEMPERATURES IN THE **550-575C** RANGE, YIELDING MORE ESTHETIC RESULTS **TOO LOW OF A LOW TEMP IS DETRIMENTAL!!!**
 - TESTING HAS SHOWN THAT HIGH TEMPERATURES IN THE 770C AND ABOVE RANGE LOOK VERY GOOD WITH THESE MATERIALS



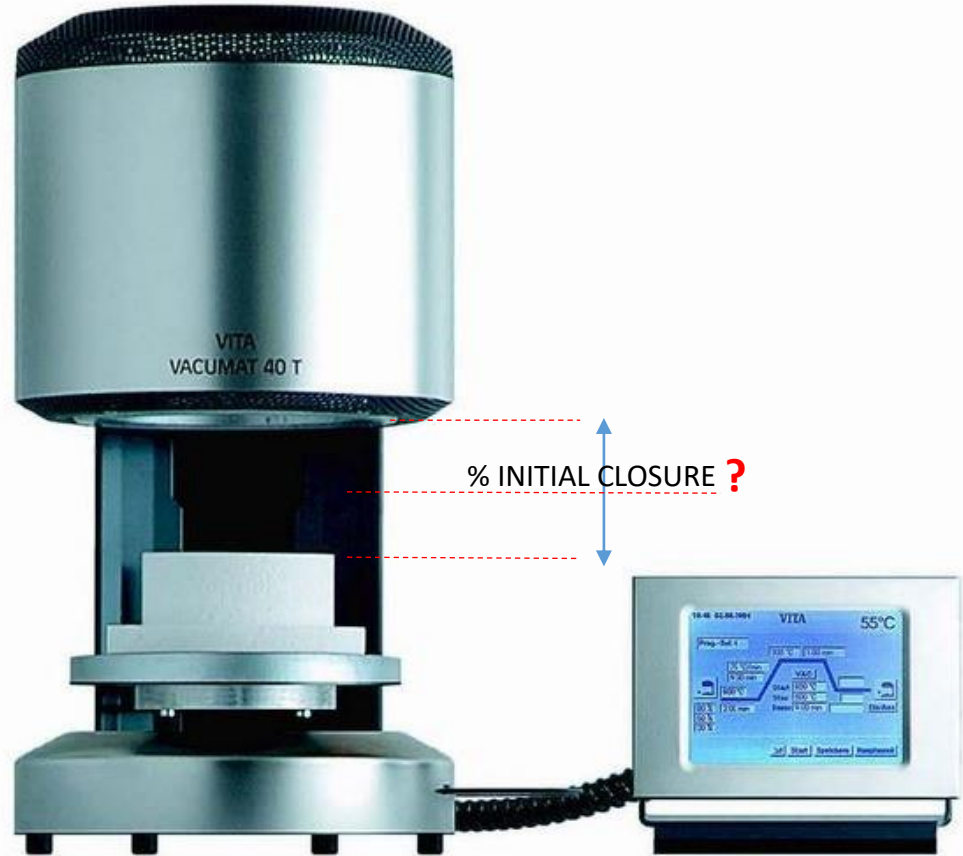
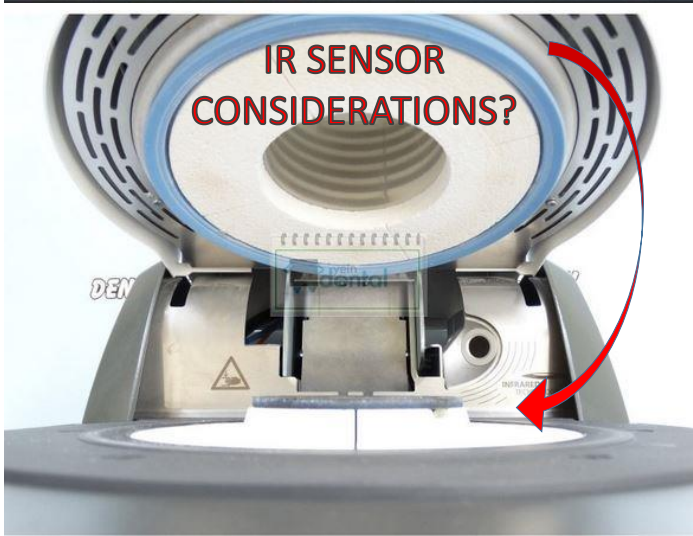
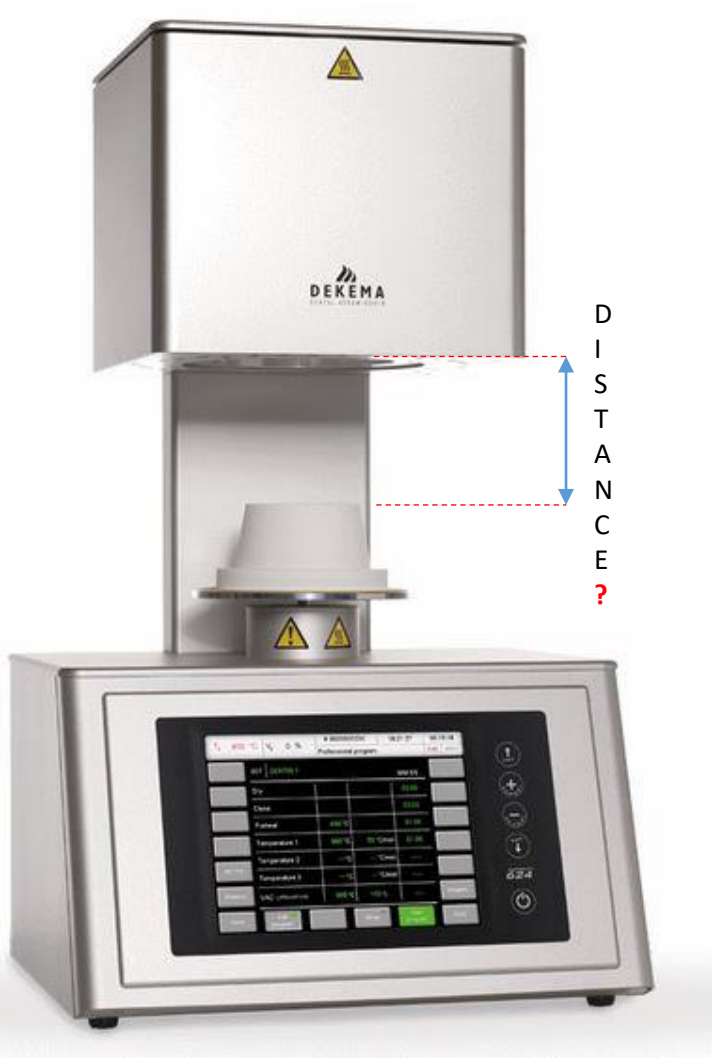
THE NEXT SLIDE ILLUSTRATES WHAT HAPPENS
WHEN LOW TEMPERATURES AND DRYING TIMING
ARE NOT OPTIMIZED!!!

EXAMPLES OF TEARING, PITS AND BUBBLES



GENTLE PRE-DRY, PROPER CLOSURE TIME AND CORRECT LOW TEMPERATURE WOULD HAVE PREVENTED THESE ISSUES

UNDERSTANDING HOW OVENS HEAT/DRY DIFFERENTLY



CONDUCTIVITY OF MATERIALS

A paper published by 3M had this amazing table (except for titanium values):

MATERIAL	YOUNG'S MODULUS (Gpa)	MELTING POINT (C)	THERMAL CONDUCTIVITY W/(mK)
Silver	83	962	429
Gold	78	1064	318
Gold Alloy	93	1100	200
Base Metal	204	1240	40
Alumina	360	2072	30
Titanium	110-114	1670	19-23
Zirconia	200	2700	2

THIS IS
SIGNIFICANT!

LITHIUM
(DI)SILICATE
IS EVEN LESS!

This means that firing stains, glazes or layered materials to **zirconia or titanium** is not going to be exactly like firing to PFM's that technicians are familiar with and this will necessitate altered thinking and adjustment of furnaces to compensate for bulk/mass

PRE-DRY & CLOSING TIME

- PRE-DRY TIME IS NECESSARY TO HAVE THE NON-CONDUCTIVE FRAMEWORK ABSORB HEAT TO GENTLY START THE DRYING PROCESS
 - TIME REQUIRED WILL DEPEND ON:
 - THICKNESS OF APPLICATION OF INSYNC PASTE GLAZE & MIYO
 - THICKNESS AND/OR MASS OF SUBSTRUCTURE MATERIAL IS APPLIED TO
 - ANGLE AND DISTANCE FROM HEATING CHAMBER
- CLOSING TIME WILL DEPEND ON:
 - MASS OF FRAMEWORK (ABILITY TO ABSORB HEAT)

	NORMAL SINGLES	THICKEST SINGLES/ 3-UNIT BRIDGES	HEAVIER BRIDGES/ MULTIPLE PONTICS	GREAT MASS & 'ALL ON 4' TYPES
PRE-DRY TIME (ONLY A SUGGESTION)	4 MINUTES	5 MINUTES	6 MINUTES	*9 MINUTES
CLOSURE TIME (ONLY A SUGGESTION)	6 MINUTES	5 MINUTES	6 MINUTES	*9 MINUTES

* WHILE ALL TIMES ARE SUGGESTED STARTING POINTS AND DEPENDANT ON FURNACE TYPE AND MASS OF MATERIAL, LARGEST AND HEAVIEST CASES NEED EXTRA TIME

HEAT OR 'RAMP' RATES

Firing Parameters

One Shot & Structure techniques for one or multiple firings.

	Dry Time (min)	Entry Time (min)	Low Temp °C	Vac Start °C	Heat Rate °C/min	High Temp °C	Hold Time (min)
MiYO Colors & InSync Glaze* paste or spray	4	6	450	550	55	720	1(air)
	Dry Time (min)	Entry Time (min)	Low Temp °C	Vac Start °C	Heat Rate °C/min	High Temp °C	Hold Time (min)
MiYO Structure*	4	6	450	550	55	720	1(air)

CTE (25-500°C) [*10-6 K-1] ± 1.0: MiYO Colors & Structure 7.4 (2x)

CTE (25-500°C) [*10-6 K-1] ± 0.5: InSync Glaze 7.3 (1x)

* Firing parameters represent standard values and may need to be adjusted.

* Final results should be the determining factor in furnace adjustments.

* If higher sheen is desired, increase high temperature.

Important

The larger the mass of zirconia, the slower the rate of temperature increase is required to allow the large mass to heat up the same internally and externally.

NOTE: CARE SHOULD BE GIVEN TO USE SLOWER COOLING ON THESE LARGER MASS CASES AS WELL, UNDERSTANDING THAT YOU CAN COOL TOO FAST, BUT NOT TOO SLOW.

HEAT OR 'RAMP' RATES START AT A SUGGESTED 55C/MIN THIS WOULD BE FOR SMALLER RESTORATIONS (QSG ON LEFT)

AS STATED BELOW THE CHART IN THE 'IMPORTANT' NOTATION, LARGER CASES WITH MORE MASS/CROSS-SECTION THICKNESS WILL NEED SLOWER HEAT RATES TO ALLOW HOMOGENOUS HEAT-UP AT A RATE THAT IS CONSISTENT WITH THE PORCELAIN OVEN

USING RATES THAT ARE TOO FAST (FOR THE LARGER MASS CASES) CAN RESULT IN INCONSISTENT RESULTS THAT MAY INCLUDE: BLOTCHINESS, OPACITY OF COLOR, PITTING OF THE SURFACE AND IN EXTREME CASES, LATENT CRACKING OF PARENT MATERIAL. THIS IS A ZIRCONIA ISSUE AND CAUSED BY POOR CONDUCTIVITY.

SINGLES

55C/MIN

LARGER SINGLES

45C/MIN

SMALL BRIDGES

45C/MIN

LARGER BRIDGES

40C/MIN

LARGEST BRIDGES

***~30-35C/MIN**

*** (LARGER MASS DICTATES SLOWER HEAT RATE)**

HIGH TEMPERATURE DETERMINANTS

Firing Parameters

One Shot & Structure techniques for one or multiple firings.

	Dry Time (min)	Entry Time (min)	Low Temp °C	Vac Start °C	Heat Rate °C/min	High Temp °C	Hold Time (min)
MiYO Colors & InSync Glaze* paste or spray	4	6	450	550	55	720	1 (air)
	Dry Time (min)	Entry Time (min)	Low Temp °C	Vac Start °C	Heat Rate °C/min	High Temp °C	Hold Time (min)
MiYO Structure*	4	6	450	550	55	720	1 (air)

MIYO STRUCTURE MATERIALS

MIYO STRUCTURE MATERIALS FIRE EASILY AT 720C, BUT MANY OVENS WILL FIRE IT TO A SMOOTH FINISH AT THAT TEMPERATURE WITH A ONE MINUTE HOLD

IF DETAILED SURFACE TEXTURE IS TO BE RETAINED, MANY OVENS GIVE GOOD RESULTS IN THE 710C RANGE AND HOLD TIMES OF 30-45 SECONDS ARE QUITE NORMAL. REMEMBER, THE LARGEST MASS CASES WILL RETAIN HEAT AND MAY REQUIRE LOWERING THE HIGH TEMP SLIGHTLY (~UP TO 5C OR SO). SUBSEQUENT FIRES, IF NECESSARY, WILL UTILIZE THE SAME HIGH TEMPERATURE, JUST SHORTENING THE HOLD TIME.

THE QSG, TO THE LEFT, IS A STARTING SUGGESTION. THIS WORKS IN SPECIFIC SITUATIONS WITH CERTAIN OVENS. YOUR SITUATION MAY HAVE DIFFERENT VARIABLES

MIYO COLORS AND INSYNC GLAZES

THE MIYO COLORS AND INSYNC GLAZES HAVE A WIDE TOLERABLE RANGE OF WORKING TEMPERATURES. WHILE THEY WORK AT 720C, THEY WILL ALSO FIRE ACCEPTABLY UP TO THE LOW 800C RANGE WITH NO ILL EFFECTS (THEY ARE STABLE).

THINNER APPLICATIONS CAN EXHIBIT A 'SATIN-LIKE' APPEARANCE WHEN FIRED LOWER, SO FIRING HIGHER GIVES THEM BETTER MATURITY. WHILE THICKER APPLICATIONS FIRE 'GLASSY' WHEN FIRED TOO HIGH, THEY CAN BE FIRED IN THE 720C RANGE AND LOOK BETTER. SPECIFIC SITUATIONS REQUIRE ADAPTATION OF TECHNIQUE

THE LARGEST MASS CASES WILL HOLD HEAT LONGER, DUE TO THEIR POOR CONDUCTIVITY. THIS WILL HAVE A SIMILAR EFFECT AS A HIGHER HIGH TEMPERATURE. IT MAY BE PRUDENT ON THE LARGEST CASES TO SLIGHTLY LOWER HIGH TEMPERATURES

HOLD TIMES AT HIGH TEMPERATURE

- **MIYO COLORS AND INSYNC GLAZE** CAN EASILY HANDLE HOLD TIMES OF ONE MINUTE AT HIGH TEMPERATURE
 - EVEN WITH REPEATED BAKES
- **MIYO STRUCTURE** MAY NEED TO HAVE HOLD TIMES OF LESS THAN A MINUTE DEPENDING ON WHAT LEVEL OF SURFACE TEXTURE NEEDS TO BE MAINTAINED
 - THIS IS AFFECTED BY MASS OF RESTORATION
 - THIS IS AFFECTED BY REPEAT STRUCTURE BAKES (LESS HOLD TIME ON SUBSEQUENT BAKES)

COOLING CONSIDERATIONS

- COOLING IS ENTIRELY DICTATED BY THE PARENT MATERIAL (FRAMEWORK) AND ITS MASS
- THE LARGER THE MASS, THE MORE SLOWLY IT NEEDS TO BE COOLED (WHEN USING A POOR CONDUCTOR LIKE ZI)
- IF THE CASE IS A MIXTURE OF SMALLER ABUTMENTS AND LARGER PONTICS (THIN TO THICK), THE PONTICS WILL DICTATE THE SLOWNESS OF COOLING, DUE TO THEIR LARGER MASS
- CASES THAT HAVE BEEN COOLED TOO QUICKLY COOL UNDER TENSION. THERE IS NO 'STATUTE OF LIMITATIONS' IN CHEMISTRY AND PHYSICS AND A CASE CAN POTENTIALLY CRACK AT ANY TIME IN THE FUTURE
- THERE ARE NO 'REAL' STEADFAST RULES FOR COOLING, DUE TO THE COMPLEXITIES OF THE MANY VARIABLES ASSOCIATED WITH DIMENSIONS, VARYING THICKNESSES, AND CHEMISTRIES OF DIFFERENT MATERIALS LIKE ZIRCONIA & LITHIUM (DI)SILICATES
 - SOME 'starting points' to *consider* and use common sense with:

• Smaller units, thinner units:	2-3 minutes
• Larger/thicker units & small 3 unit bridges	4-6 minutes
• Firing tray full of smaller to medium units	4-6 minutes
• Firing tray full of medium to larger single units	6-8 minutes
• Medium to heavy splint/bridgework with pontics (5-6 units)	8-10 minutes
• Larger splints/bridgework with heavy pontics (6-10 units)	10-12 minutes
• Full arch cases, 'all-on-four', larger cases with tissue areas	14-18+ minutes

OVEN OPERATION VARIABLES AFFECTING HIGH TEMPERATURE AND HOLD TIME + COOLING TIME

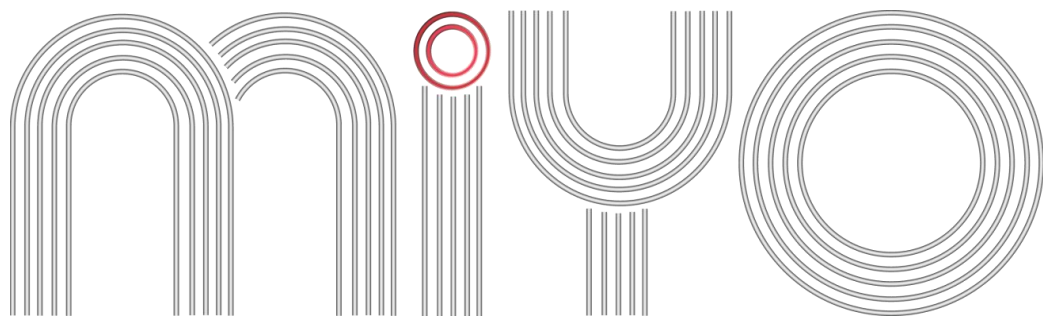
MATURITY OF MiYO IS A FUNCTION OF TEMPERATURE & TIME

- TEMPERATURE

- LARGER MASS ZIRCONIA CASES NEED TO BE HEATED SLOWER (POOR CONDUCTIVITY) AND WILL ABSORB MORE HEAT DUE TO THE SLOWER CLIMB
- THESE SAME CASES WILL RETAIN HEAT MUCH LONGER, DUE TO POOR CONDUCTIVITY

- TIME

- DIFFERENT MAKES OF OVENS HAVE DIFFERENT LONG-TERM COOLING SYSTEMS
- SOME COOL GRADUALLY, WHILE SOME COOL MUCH MORE SLOWLY DUE TO PROCESS
- WITH SUBSTANTIALLY DELAYED COOLING, THE HIGH TEMPERATURE MAY NEED TO BE ADJUSTED LOWER...WITH *LITTLE OR NO NEED* FOR A HIGH TEMPERATURE HOLD
(**LARGER TO LARGEST CASES WITH MOST MASS**)



MiYO COLOR/INSYNC PASTE GLAZE AND STRUCTURE MATERIAL POSSIBLE STARTING POINTS FOR CYCLES (FROM MOST RECENT TESTING)

MiYO COLOR/INSYNC PASTE GLAZE AND STRUCTURE

SUGGESTED STARTING POINTS FOR CYCLES

	ZI COLOR/ISG		ZI STRUCTURE		e.MAX TYPE COLOR/ISG	e.MAX TYPE STRUCTURE
	SMALL CASES	LARGER CASES	SMALL CASES	LARGER CASES	CASES LIMIT TO 3-UNITS	CASES LIMIT TO 3-UNITS
LOW TEMP	450C	430C	450C	430C	575C	575C
PRE-DRY TIME	4-5 MIN	6-9 MIN	4-5 MIN	6-9 MIN	4-5 MIN	4-5 MIN
CLOSURE TIME	6 MIN	7-9 MIN	6 MIN	7-9 MIN	5 MIN	5 MIN
CLIMB- RATE	45C/MIN *	45C/MIN *	45C/MIN *	45C/MIN *	45C/MIN *	45C/MIN *
VAC ON/OFF	510C/HIGH TEMP	510C/HIGH TEMP	510C/HIGH TEMP	510C/HIGH TEMP	575C/HIGH TEMP	575C/HIGH TEMP
HIGH TEMP	745-760C ¹	735-750C ¹	710C ¹	705C ¹	770C ¹	710 ¹
HOLD TIME	1 MIN	1 MIN	30-40 SEC	0-20 SEC	1-2 ² MIN	30-40 SEC
COOL TIME	3-5 MIN	8-18 MIN	3-5 MIN	8-18 MIN	3-5 MIN	3-5 MIN

IMPORTANT: TABLE ABOVE SHOULD BE CLOSE, BUT TEMPERATURE AND TIME ADJUSTMENTS FOR YOUR OVEN AND STATE OF CALIBRATION WILL DICTATE TESTING TO ENSURE PROPER RESULTS

LEGEND FOR TABLE ABOVE

* : CLIMB RATE FOR SMALLER SINGLES CAN BE 50-55C/MIN. CLIMB RATE FOR MEDIUM UNITS TO 3-UNIT BRIDGES SHOULD BE AROUND 45C/MIN. CLIMB RATE FOR LARGER CASES WITH BULK/MASS WILL NEED TO BE IN THE 35-40C/MIN RANGE. BIGGER & THICKER = SLOWER RATE

¹: HIGH TEMPERATURE WILL BE AROUND THE TEMPS LISTED. YOU MAY NEED TO RAISE OR LOWER VALUES BASED ON OVEN AND STATE OF CALIBRATION.

²: 770C WILL MOST LIKELY TAKE CLOSER TO A 2 MINUTE HOLD TIME. FIRING TO 780-790C CAN LESSEN TIME TO 1 MINUTE WITH NO ILL EFFECTS ON COLOR.

NOTE: The information provided is a close starting point and it is the responsibility of the lab/technician to check to make sure parameters work in oven utilized.

THANK YOU!

WE VALUE YOUR TIME

OUR PRIMARY CONCERN IS YOUR SUCCESS

WE APPRECIATE YOUR BUSINESS AND WELCOME YOUR FEEDBACK

ALWAYS LET US KNOW IMMEDIATELY IF YOU HAVE ANY PROBLEMS OR ISSUES