BLUECAST X10 TDS

Rev1 16/12/2018

Disclaimer

Following information are suitable for BlueCast X10 resin and will not apply to other resins, data are from our R&D department and this TDS will be updated according new data we will gather, so please check www.bluecast.it for updated release. We have no responsibility for usage of following info by user even if they are our best knowledge.

Introduction

BlueCast X10 is the evolution of our well known X5 polymer for direct investment casting of jewelry and dental patterns. It's a resin developed to give perfect casting using wax equipment as well normal gypsum bonded investments.

Main improvements can be listed in:

- better plate adhesion
- less shrinkage
- no ash even at lower temperature
- improved detail

As for our LS, Original and X5 resins, X10 is monomer free, this means no harmful low molecular mass chemical you have to deal with. Even if X10 is NOT carcinogenic, NOT toxic and safe, we strongly suggest users to wear protective equipment as stated in MSDS because of presence small amount of phosphine oxide that can result irritating.

X10 core is custom developed oligomer based on modified urethane backbone functionalized by a methacrylic acid that exhibits the attitude to sublimate (passing from solid to gas phase without liquid one) without volume expansion and releasing during this phase CO CO2 and water.

Investment

Even if we successfully tested almost any investment commercially available with good results, we discovered that Optima Prestige by Certus give best detail and surface quality and it's very forgiving on small errors that can occur during flask preparation, but following instructions will assure good result with all gypsum bonded investment:

Storing investment powder

Always keep it a closed box/bag, air moisture will start reaction every time you open it, so open and close for the strict time you need to bring powder.

Water

Never use sink water, it contains chloride as well minerals, use only distilled water

Ratio

Even if you can change a little the water/powder ratio, mind that lowering water will give you harder/brittle investment and also will be more difficult for sublimation's gases to exit creating cracks, on other side if you increase water you will get a more softer investment, rougher surfaces and loss of details.

Temperature

Temperature of both water and powder will affect investment quality and pot life. Store water in refrigerator and powder is in the coldest place you have. Gypsum hardening is exothermal reaction and more heat you supply to it, faster will be the hardening and fast hardening is will lead to cracks and poor investment resistance.

Boric Acid

It' used to give more strength to investment, very difficult to devest, will close too much pores into investment causing cracks, we do not suggest to use with X10

Fast burnout

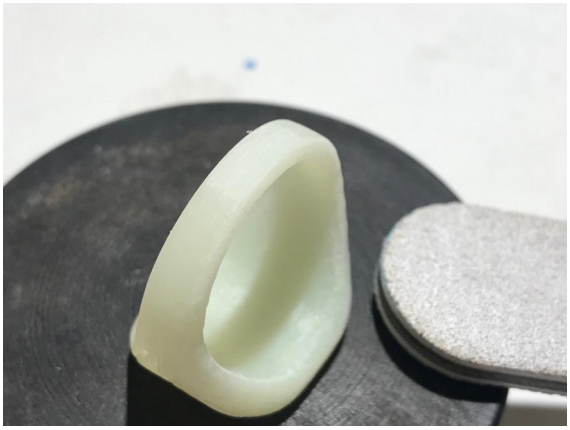
X10 is suitable for fast burnout, if you want to use it mind you need to apply for extra wax sprues around pattern; wax will melt away quickly leaving routes for gas to exit. Mind huge quantity of gas will released by patterns and this will result in investment breaks!

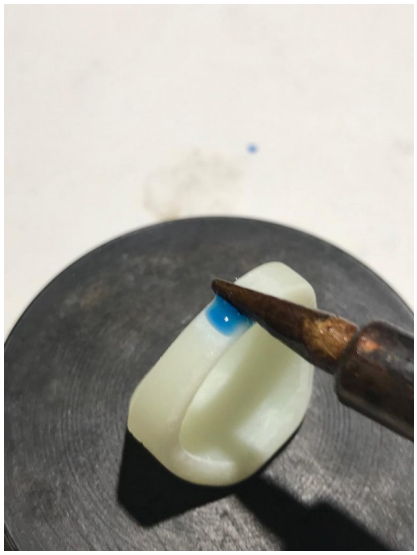
Patterns preparation

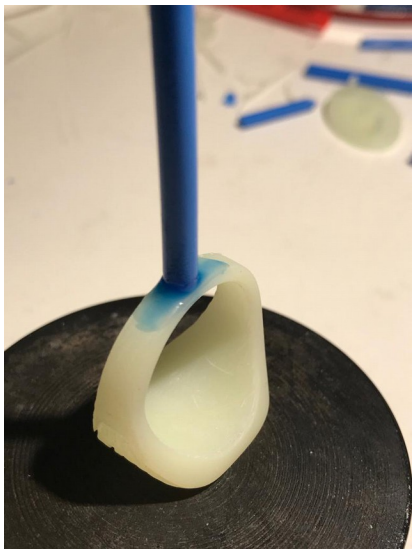
No preparation, there is no need to apply for boiling, days curing or other esoteric rituals, print, wash, dry and go for casting (you can go for 10mins postcure to be sure there is no uncured resin leaved by washing, especially if you do not use last bath into clean alcohol)

Casting tree preparation

Same as wax, use sand paper to make welding zone rough, apply a drop of wax, stay on for some seconds, weld wax sprue







Protective spray or dipping coat
Forget about, surface tension of X10 is proper and there is no reaction/interaction resin/investment

Flask Settling time
Even if minimum is generally recommended in 2 hours, we strongly suggest 4 to 6 hrs especially if you have positive/negative engravings.

Flask type
ALWAYS use flask with holes even if you use closed system, holes helps gas to exit during sublimation phase

Burnout cone up or down?
Down for whole burnout

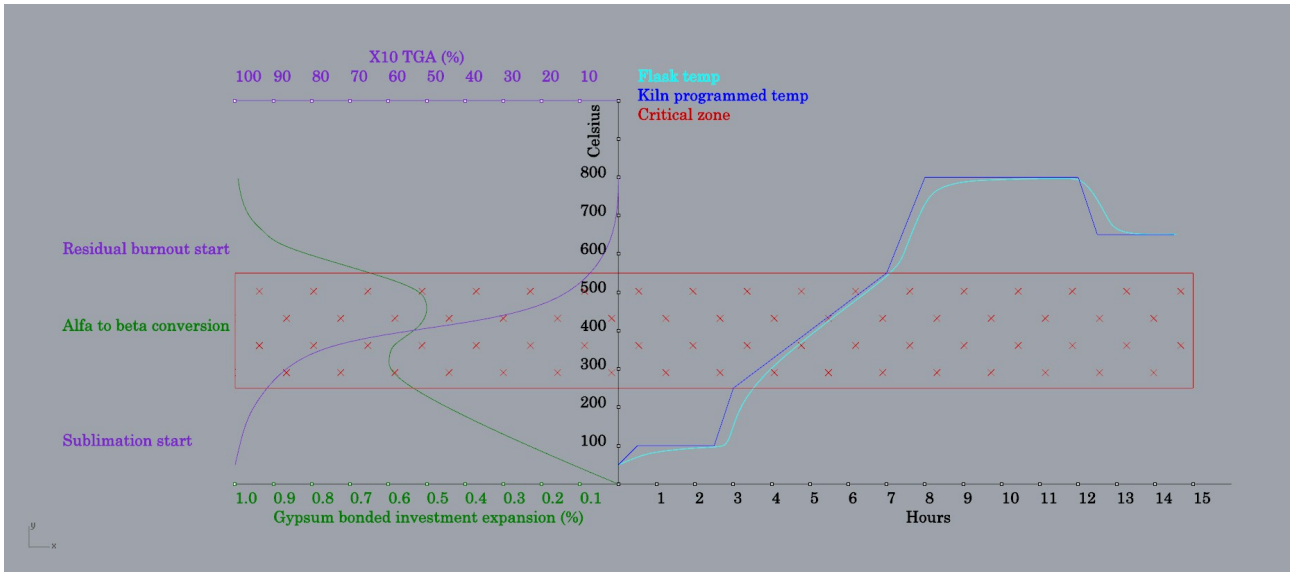
Burnout temperature
First thing you have to accept is that temperature you set on kiln is not temperature you get into flask and according flask position into kiln you will experience HUGE temperature difference.
Best suggestion is you to prepare a dummy flask with just hole for temperature probe and run a burnout cycle keeping track of temperature you set and what you get. Mind that 3 things are important with X10

- speed you increase temperature from 250c to 550c (max 2 Celsius/min)
- max temperature flask reaches (at least 740c, suggested 780c)
- hours you stay at max temperature (min 3 hours, suggested 4)

If you respect this parameters you can be sure you managed X10's sublimation and residual burnout properly.
Now about investment; it's common credence that gypsum bonded investment cannot withstand temperature over 720c. That's a hoax, reality is that over 750c a chemical reaction will occur: $2CaSO4 \rightarrow 2CaO + 2SO2 + O2$ and from this reaction we get oxygen (very good to convert C residuals in CO2) and sulfur dioxide, gas that will slowly escape from investment during last burnout phase and removed almost completely during vacuum before casting.
Please keep in mind that pouring metal into flask will always generate sulfur dioxide and this is the main reason why you get oxidated surfaces on castings, so there is no concern into running a burnout up to 800c.

This page was left intentionally blank for no reason.

Some technical data about X10 and our preferred burnout



Purple is TGA (thermogravimetric analysis) of X10
Green is investment expansion/contraction
Blue is our burnout programmed cycle
Cyan is effective temperature inside flask

As first we have to remove water not used by gypsum in order to become hard (mind only 18gr of water are effectively used by 100gr of gypsum) and this is the first burnout phase at 100c.

Then we move to the "critical zone" relatively quickly because in this phase expansion is almost linear, X10 will not release lot of gas.

As you can see the "critical zone" is from 250c to 550c where we can observe the change of calcium sulfate from alpha to beta phase and we have the most of sublimation (gas release). In this zone we have to raise temperature slowly as possible, in order to let gas created by patterns as well steam created by calcium sulfate dehydration exit from investment micro structure without damaging investment surface as well structure.

Passed the "critical zone" we can ramp relatively quickly to our destination, the residual burnout.

Finished the burnout we decrease slowly to casting temp to avoid cracks due to flask/investment different thermal expansion.