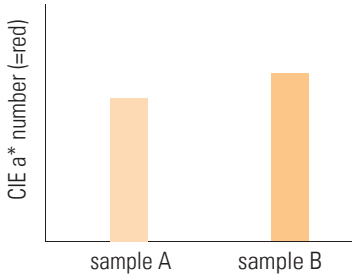
Factors That Affect the Final Color of Zirconia Restorations

(A) (B)



same zirconia, same color liquid, sintered in different sintering ovens
(A) was sintered in the DuoTron oven, whereas (B) was sintered in a conventional oven

1. Coloring liquid

Origin® CHROMA™ coloring liquid was developed based on zirconia powder processing unique to ORIGIN® Live™ zirconia. Other zirconia processed with a different technology will respond differently to the same coloring liquid. For best results, please match Origin® LIVE™ zirconia with Origin® CHROMA™ coloring system.

2. Sintering oven

The Origin® zirconia coloring system, CHROMA™, was developed based on the test results sintered from the ORIGIN® DuoTron™ oven which is one component of the Origin® CAD/CAM system. The DuoTron™ gives consistent and reproducible results over long periods of time. Test results show that conventional ovens with a longer sintering cycle (7-8 hours) give a result that is one shade darker (or at least a half shade darker) as compared to when the DuoTron™ oven is used. So if you are sinteing Origin® Live™ zirconia colored with the Origin® CHROMA™ system, make sure you use level 80 liquid instead of the standard level of 70.

3. Glazing temperature

The higher glazing temperature you use, the lighter color your glazed zirconia will have. The high glazing temperature for Origin® Live™ zirconia colored with the Origin® CHROMA™ system is 800 °C with a holding time of 1min 30 seconds. The proper glazing temperature schedule is introduced on page 12 of the Instructions For Use for the ORIGIN® Live™ zirconia & ORIGIN® CHROMA™ zirconia coloring system.

4. Glazing with vacuum

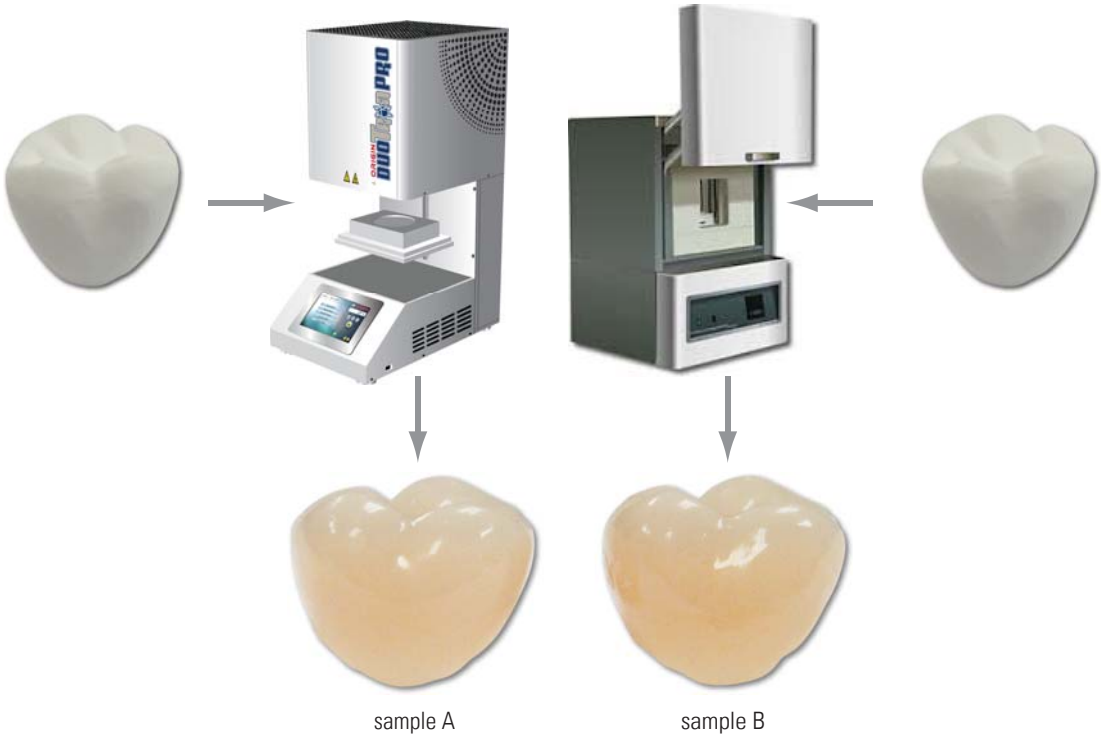
Test results show that using vacuum during glazing will create lighter shades in the final glazed zirconia. In addition, the vacuum level of different brands of glazing ovens differ from each other. As a result, we have eliminated this varying factor from our standard process and recommend that you do not use vacuum during glazing. Your glazed zirconia will still look great at the glazing temperature of 800 °C.

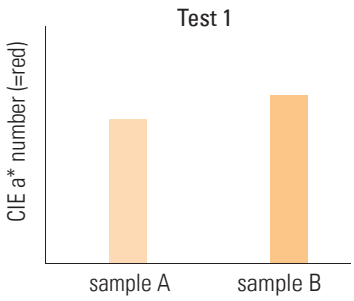
5. Light conditions when checking shade

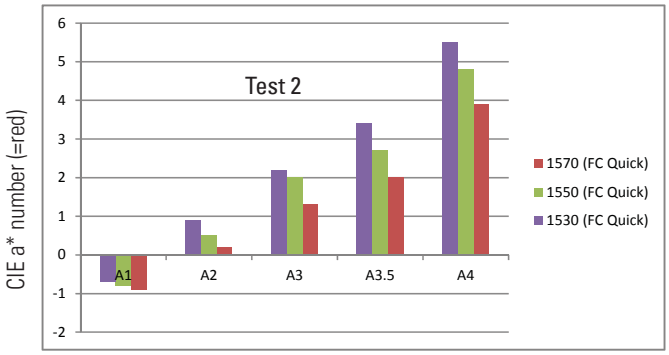
Color perception of the final glazed zirconia reatoration depends on many factors including; the light source (natural light, fluorescent light, incandiscent light), light intensity (3000 K - 6500 K), abundance of light in a room, observation angle, etc. The Origin® CHROMA™ zirconia coloring system was develped based on the following parameters.

* light source: Natural, full-spectrum light
* light intensity(color temperature): 5000 K (3000K-Soft white, 3500-Neutral, 4100 K- Cool white, 5000 K-Natural light, 6500 K - Daylight)
* color reproduction capability (color rendering index) of light source: 90%
* observation angle of the restoration: combination of straight angle and side angle
* color determination: combination of experience of skilled ceramist and colorimeter (VITA Easyshade Compact)

Different furnaces produce different results







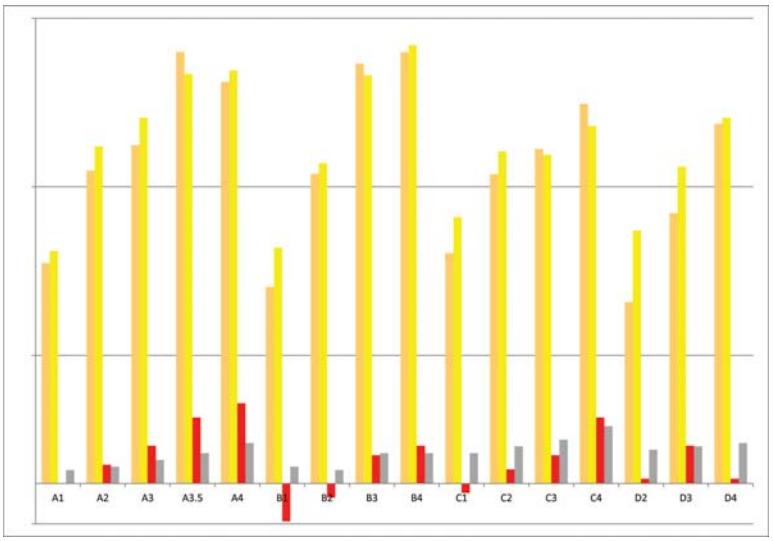
Test 1. Different Sintering Ovens - Different result in redish brown chroma

Two different ovens were tested for sintering results. The same shade zirconia (either from a pre-colored multi-layered disc or colored by the liquid method) were sintered in different ovens; sample A was sintered using the ORIGIN DuoTron quick mode (3 hrs) and sample B was sintered using a conventional oven with a long cycle time of 8 hours. The shade of sample A came out as intended, whereas sample B from the conventional oven came out with a stronger/higher chroma.

Test 2. Different Temperature Setting - Different result in chroma

The same oven was tested using different temperature settings. As the sintering temperature gets higher, the redish brown chroma of the A2 shade gets weaker. Between 1530 °C (purple bar) and 1550 °C (green bar), the difference was nearly unnoticeable, but between 1570 °C (red bar) and 1530 °C (purple bar) the chroma difference was quite noticeable.

ORIGIN zirconia & DuoTron Sintering Furnace as a whole system



The ORIGIN zirconia color system was developed based on the ORIGIN DuoTron sintering furnace

The Origin Multi-zirconia discs and the Origin coloring system, CHROMA, were developed based on numerous test results utilizing the ORIGIN DuoTron oven which is one component of the Origin CAD/CAM system. The DuoTron gives consistent and reproducible results over long periods of time. Test results show that conventional ovens with a longer sintering cycle (7-8 hours) give a result that is one-half shade to one full shade darker as compared to when the DuoTron oven is used.

More Than just Sintering - Certainty

The final shade results of the 20 pre-colored discs are best presented when sintered with the Origin DuoTron furnace. From this important aspect, the DuoTron provides certainty and consistency.

ORIGIN LIVE zirconia colors were determined under these parameters

1. Sintering Oven

Oven used: ORIGIN DuoTron
Test results show that different brands of ovens may produce different levels of chroma intensity. Under the same conditions (ex. same zirconia, same color method - either from liquid or pre-colored disc), brand A furnace produced an A2 shade while brand B furnace produced an A2.5 or A3 shade. Possible reasons include the heating coil type, heating coil thickness, age of the oven, heating chamber size, temperature schedule, degree of protective glass oxide layer over the heating coil (in the case of an MoSi2 heat source).

2. Glazing parameters

High temperature: 800 °C. Holding time: 1 min 30 sec
The higher glazing temperature you use, the lighter color your glazed zirconia will have. The proper glazing temperature schedule is introduced on page 12 in the Instructions For Use of the ORIGIN Live zirconia & ORIGIN CHROMA zirconia coloring system.

3. Glazing without vacuum

Test results show that using vacuum during glazing will create lighter shades in the final glazed zirconia. In addition, the default vacuum level of different brands of porcelain ovens differ from each other. As a result, we have eliminated this varying factor from our standard processing and recommend that you do not use vacuum during glazing. Your glazed zirconia will still look great at the glazing temperature of 800 °C

4. Color conditions when checking shades

Color perception of the final glazed zirconia restoration depends on many factors including: the light source (for example, natural light, fluorescent light, incandescent light, etc), light intensity (3000 K - 6500 K), abundance of light in a room, observation angle, etc. The Origin CHROMA zirconia coloring system was developed based on the following parameters:

Light source: Natural, full-spectrum light
Light intensity (color temperature): 5,000 K (3000K-soft white, 3500-Neutral, 4100 K-Cool white, 5000K-Natural light, 6500K-Bright daylight)
Color reproduction capability (color rendering index) of light source: 90%
Observation angle of the restoration: combination of straight angle and side angle
Color determination: combination of experience of skilled ceramist and colorimeter (Vita® Easyshade Compact)