## About Besmile

Besmile is a global digital solutions provider for restorative and implant dentistry.

We offer integrated systems—premium CAD/CAM materials, advanced equipment, and precision implant systems—designed to streamline workflows and ensure reliable results.

All core products are developed and manufactured in-house, ensuring consistent quality and continuous innovation.

Trusted by over 1,000 partners in more than 100 countries, we empower dental professionals to create confident, lasting smiles.

Technology creates the best smile.

# **Common Problems** & **Solutions**
# for Zirconia Restorations



**Chengdu Besmile Biotechnology Co.,Ltd.**
www.bsmdental.com
T: +86-28-85317108
E: info@cdbesmile.com

**Besmile Dental America Inc.**
20311 Valley Blvd, Suite#I, Walnut, CA91789
T: (626)921-5798
E: sales@bsmdentalus.com


Contact Us

@Besmile @besmile_aconia

# Common Problems and Solutions for Zirconia Restorations

## 1. Chip During Milling Process

**Possible Causes:**
- Equipment malfunction or severe bur wear
- Improper bur/disc clamping or zirconia dust accumulation
- Irregular external factors (air pressure, voltage issues)

**Solutions:**
- Replace worn burs and secure the disc before re-milling.
- Clean spindle chuck, re-clamp tools, and ensure proper fixation.
- Check environmental stability (power/air supply) according to the milling machine manufacturer's instruction.

## 2. Chip or Fracture When Removing from Zirconia Disc

**Possible Causes:**
- Inadequate grinding device speed/improper tool placement
- Non-standard procedures causing micro-cracks

**Solutions:**
- Control grinding speed at **10,000–12,000 RPM**; position tools centrally.
- Follow manufacturer guidelines:
  - Remove connector bars incrementally (e.g., grind 50% first, then complete removal)①.
  - Maintain unidirectional motion (clockwise/counterclockwise).


## 3. Fracture/Deformation After Sintering

**Possible Causes:**
- Undetected micro-cracks from milling/removal of connectors.
- Moisture in colored restorations.
- Poor layout design (stress concentration, excessive thickness).
- Improper implant hole manual drilling.
- Incorrect sintering parameters.

**Solutions:**
- Standardize pre-sintering steps (milling, removal of connectors).
- Dry restorations at **80–100°C for 45–60 minutes** post-coloring.
- Optimize layout:
  - Keep connector bars horizontal; avoid putting connectors at pontic/arch curvature areas.
  - Limit sintering frame thickness to **2.0–2.5 mm**.
- Design implant holes digitally; avoid manual drilling.
- Follow material-specific sintering cycles (avoid rapid heating/cooling rate).

## 4. Fracture After Porcelain/Glaze Application

**Possible Causes:**
- Excessive porcelain thickness/moisture.
- Incompatible porcelain/glaze materials.
- Rapid furnace heating/cooling.

**Solutions:**
- Thin porcelain layers; blot out excess moisture.
- Use material-matched porcelain/glaze.
- Adhere to manufacturer's sintering protocols.

## 5. Intraoral Fracture During Placement

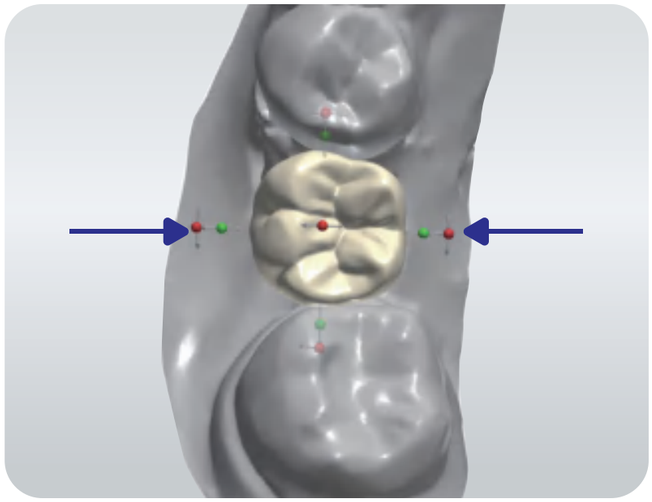
**Possible Causes:**

- Inadequate space/undercuts; sharp margins.
- Design flaws (e.g., insufficient cervical thickness, poor bridge contact).
- Undetected micro-cracks during restoration fabrication.

**Solutions:**

- Collaborate with dentists to adjust tooth preparation or opposing dentition.
- Ensure design parameters:
  - **Cervical thickness:** >0.3 mm
  - **Connector cross section area:**
    - Anterior: 7 mm² (two consecutive crowns), 9 mm² (3-unit), 12 mm² (long bridge)
    - Posterior: 9 mm² (two consecutive crowns), 12 mm² (3-unit), 16 mm² (long bridge)

**Occlusal thickness:** Maximize when possible; reduce buccolingually if needed.
**Implant hole position:** Centralize on occlusal surface, avoid edges.



## 6. Color Deviation After Sintering

### For Monolithic Zirconia:

**Possible Causes:**

- Improper coloring liquid/time

**Solutions:**

- Choose matched, valid coloring liquid.
- Follow coloring protocols:

**Thin restorations:** Extend coloring time (e.g., **10–15 seconds** for single crowns).
**Thick restorations:** Shorten coloring time (e.g., **5–10 seconds** for implants).

### For Multilayer Zirconia:

**Possible Causes:**

- Zirconia disc thickness is much greater than the restoration height.

**Solutions:**

- Use appropriately thick discs for color gradient control.

### For All Zirconia:

**Possible Causes:**

- Incorrect sintering temperature*

**Solutions:**

- Target sintering temperature: **1530–1550°C**.

**Color too dark:** Increase peak temperature.
**Color too light:** Decrease peak temperature.
**• Calibrate furnace regularly.**

* The final color outcome of the restoration depends on the extent of metal ion absorption from the shade solution and the light reflection at the grain boundaries. The optimal sintering temperature for zirconia blocks is typically between 1530-1550 ℃. When the temperature exceeds 1560 ℃, some color elements vanish, resulting in a lighter shade; conversely, if the temperature is below 1480 ℃, the zirconia will not be fully sintered (underfired), leading to a white appearance and poor translucency.

## 7. Poor Translucency

**Possible Causes:**

• Incorrect use of coloring liquid for incisal part.

• Rapid heating/insufficient temperature holding time.**

• Excessive material thickness causes a reduction in visual transparency.***

**Solutions:**

• Apply incisal coloring liquid only to the incisal third.

• Control sintering:

Heating rate: Gradual

Temperature holding time: **120–150 minutes**

** With the increase of temperature and holding time, the average grain size of zirconia increases, the final density increases, and the crystal arrangement becomes more uniform, resulting in an increase in semi-transparency. This is especially true for long-bridge and partial arch restorations. To ensure both translucence and strength while reducing the probability of deformation, a slower heating and cooling rate is required.

*** With the increase in thickness of zirconia materials, the number of grain boundaries increases, blocking the passage of some light and reducing its semi-transparency. While the transmittance decreases, the reflectance increases, resulting in a higher value of luminance. Moreover, research has shown that as the thickness of zirconia increases, the yellow tone of the restoration also increases.

## 8. Contamination/Green Discoloration

**Possible Causes:**

• Absorption from wooden surfaces post-coloring

• Contact to metal tools during drying process

• Oil/water spray from unfiltered air guns

• Polluted sintering beads or furnace

**Solutions:**

• Avoid direct contact with absorbent materials(e.g., wood, paper) after applying coloring liquid.

• Avoid direct contact with metal during drying/sintering.

• Use filtered air tools; clean sintering beads/furnaces regularly.

• Cover sintering tray during sintering.