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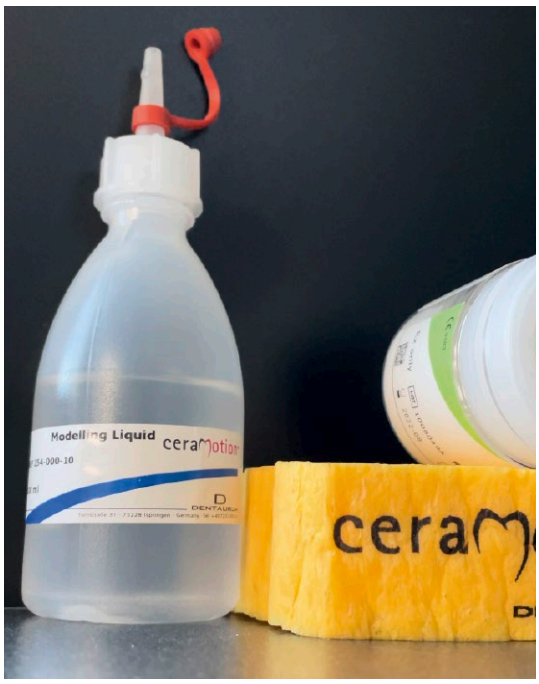
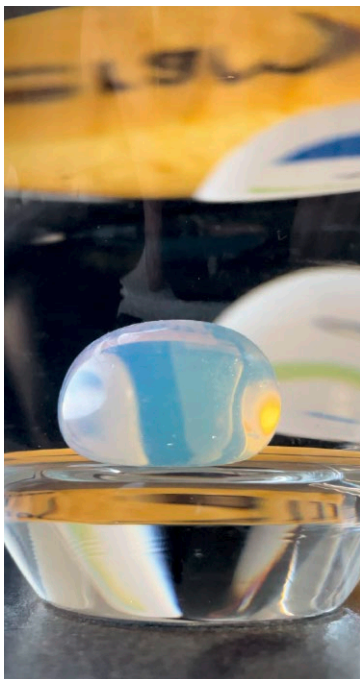
Heike investigates ...

In the third part of the "Heike investigates ..." series of articles, everything revolves around the correct handling of ceramic materials BEFORE firing – recognizing myths, dispelling myths. Heike examines whether different handling has an influence on the firing results when mixing the ceramic materials or whether this is more of a myth.





What actually happens to the ceramics if one does not follow the instructions and really ...

... does everything wrong? Well, Heike has tested it!

So – what are we actually talking about here?

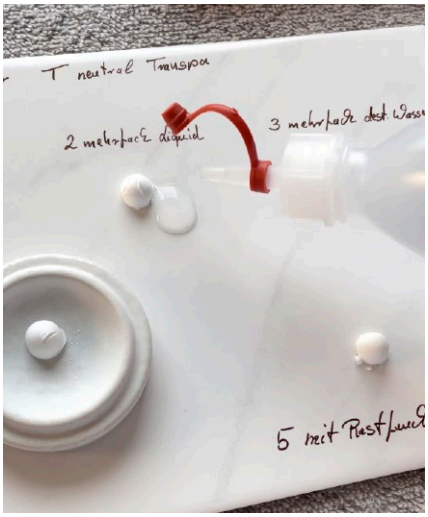
In the course of my career, I have often heard phrases such as: "We've always done things this way", "That's simply the way it's done!", "Under no circumstances should it be done this way, otherwise it isn't going to work!" Only few people question themselves and their actions. And such comments are then passed on as facts for decades. Often, however, without having current developments in mind. That is why I have made it my basic task to dispel these and similar "beliefs". Not only do I want to break old, outdated habits in my own mind, I also want to encourage people to do the same for themselves. Especially when it comes to training the next generation of dental professionals. Even if it is a tedious exercise to always check, re-examine or re-test everything, we can all benefit from not simply taking every piece of advice at face value, but rather taking a look behind the famous facade ourselves and assessing whether what we teach is

still valid today. In the end, it could even come to a point where we become friends with new products, even though we have preferred the same materials for so many years simply because we are familiar with them. However, who knows, maybe one of the new materials will be able to pick us up comfortably at the level we are with our skills, while at the same time giving us better results.

Mini experiments under real laboratory conditions

We are all familiar with scientific studies. And even if most of the topics are actually extremely exciting, for us practitioners much is just purely theoretical. Which brings us back to my main concern: we are practitioners! We love making things with our hands, being productive and occasionally just simply toying around with our materials or devices. So why not have a go yourself and see what happens when we deliberately commit a supposed no-go. After all, dental prosthetics is an extremely exciting profession. So why don't we demonstrate this to our future generations and encourage them to test for themselves what happens when ...?

The five different firing samples …



The test was conducted with a ceramic from Dentaurum: ceraMotion® Zr Transpa

Ceramic materials – mixing, build-up, cleaning

For my new experiment, I chose ceraMotion® Zr Transpa as an example. I wanted to know what would actually happen if I didn't handle the ceramic material the way I had been taught during my training. We've all heard it before: ceramic materials are only mixed once. Of course, with the corresponding liquid on a highly expensive wet plate. Dried residues are quite naturally thrown away. That's the only way to go. But what happens if one does not stick to these golden rules? If one brazenly ignores them? Let's give it a try!

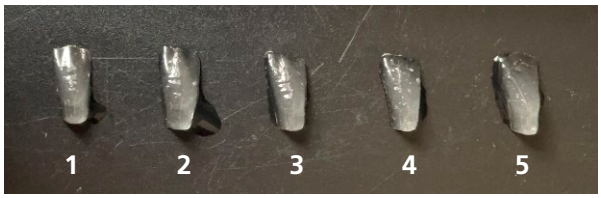
… on platinum foil ready for firing. The elevation ensures that the firing samples occupy a similar position in the firing chamber to that of our usual crowns.

	Start-temp. °C (°F)	Drying time (min)	Heating rate °C (°F) /min	Vacuum start °C (°F)	Vacuum end °C (°F)	Firing temperature °C (°F)	Holding time**
Dentin 1	500 (932)	6	55 (131)	500 (932)	750 (1382)	750 (1382)	2 min (under vacuum)

* Reducing the heat rate improves the firing quality in the case of large restorations.
** Extend the hold-time in the case of large restorations to compensate for the poor thermal conductivity of ZrO_2.

The firing parameters

The finished fired samples straight from the furnace …



… and freed from the platinum foil.

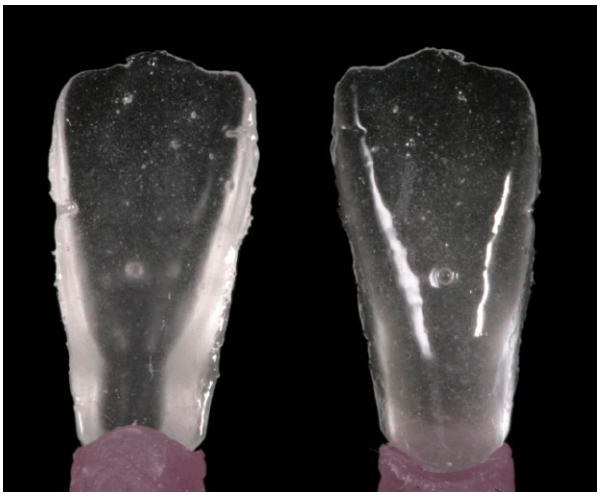
The test design:

To conduct my test, I use the ceraMotion® Zr Transpa material, all from the same tin. To start with, all five samples are mixed with the corresponding mixing liquid to create an absolutely identical starting point. This is followed by the modifications in terms of the no-gos to be tested and firing everything with identical firing parameters. In short: everything is simply put in the furnace together!

Firing sample 1: crystal-clear ceramic material, according to instructions, on platinum foil. → This is my reference piece, which will go into the furnace completely dry.
Firing sample 2: dried, crystal-clear ceramic is moistened several times with mixing liquid and fired on platinum foil. → The results are supposed to be quite terrible. The theory states that multiple mixing with ceramic liquid leads to a doubling of the crystalline structures! I'm genuinely curious to see whether my test series will confirm this.
Firing sample 3: dried, crystal-clear ceramic is moistened several times with distilled water and fired on platinum foil. → The theory states that this will lead to the formation of bubbles.
Firing sample 4: crystal-clear ceramic is mixed in a well and fired on platinum foil. → Using a well for mixing is supposed to be an absolute "no-go". The reason being: since heavier ceramic components sink to the bottom and lighter ones rise to the top, one does not obtain a homogeneous ceramic material for layering when picking up with the ceramic brush.
Firing sample 5: conventionally mixed ceramic material placed in the furnace with residual moisture. → Basically, this is my second reference piece, the moist counterpart to firing sample 1, which contains no moisture at all.

The firing parameters:

I modified the original firing parameters of the ceraMotion® Zr Transpa slightly for my furnace and the mini test series! If one now examines the sharp edges and the glaze level of the finished firing samples, it becomes crystal clear that the modified parameters were exactly right for this test. To ensure that the firing material reaches the same position as is normal for our crowns, I placed them slightly elevated in the firing chamber.



To recap: this firing sample was supposed to deliver a perfect result, …

… this one was supposed to appear cloudy and with a cracked surface, …

… this one with bubbles, …

… this one milky …

… and this one the same as firing sample 1 – in other words, with a perfect firing result. For me, however, only the result of firing sample 1 was really convincing. And how did you fare?

Temperature at start: 500°C
Preheating time: 6 minutes
Pre-vacuum: 30 seconds
Heat rate: 45°C/minute
Firing temperature: 760°C
Firing time: 2 minutes, under vacuum
No LTC (long-term cooling)

Pro tip for all those who want to gain an edge over others:
To achieve a more homogeneous and clearer firing result with the ceramic, simply set a pre-vacuum of 30 seconds in your furnace, if possible. And by the way, this works for all ceramic systems!

These results were to be achieved/need to be checked:
Firing sample 1 → Must deliver a perfect result according to the manufacturer's specifications and a perfectly calibrated furnace!
Firing sample 2 → Should appear cloudy and with a cracked surface.
Firing sample 3 → Should come out of the furnace with bubbles.
Firing sample 4 → Should appear milky and cloudy (unmixed).
Firing sample 5 → Should also be a perfect result, i.e. crystal clear like sample 1.

The firing result:
The firing results of all firing samples from 1 to 5 all have one thing in common: bubbles. This may of course be due to my method of processing and should in no way be attributed negatively to the ceramic. However, differences in homogeneity are clearly visible.

Conclusions

In my opinion, firing sample 1 achieved the best result. It therefore follows that some rules are not myths after all. Nevertheless, I would recommend everyone to simply copy this experiment as this is the only way to find out how to achieve the best result for yourself. Plus, it's great fun and exciting to get to know your own ceramic material even better through these tests. This in turn means that one can generally achieve better results. The reason being that only those who have mastered their craft can deliver top performance – and for me, this also includes simply putting the materials through their paces.

If you want to find out more, browse through Heike's blog. There, the master dental technician and mother of two devotes herself to a wide range of dental prosthetic topics. "Advancement through knowledge" is her motto on the blog. Simply scan the QR code and start browsing:
assmann-dentalservice.de

True to her motto – knowledge transfer via the blog – she also shares numerous dental prosthetic tips and tricks on her social media channels.
YouTube: https://youtube.com/channel/UCitUnUDr2inKK-VwAd6lPMzw

Instagram: https://instagram.com/heike_assmann?igshid=YmMyMTA2M2Y=

Facebook: https://www.facebook.com/AssmannDentalService

CONTACT

If you wish to contact Heike Assmann, it's quite simple, as she keeps up with the times. The messenger functions of the social media channels quite virtually provide a direct line to her. One can also contact Heike Assmann quickly by surface mail or e-mail:

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