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Reprint

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Knut Miller gives tips on how to produce the best results with Ceramill Sintron

Non-precious metal comes of age

An article by Knut Miller, Vaduz/Liechtenstein

Chrome cobalt! A term like an impenetrable wall. Hard, cold, merciless. It is little wonder that non-precious metal dental alloys do not have a good reputation – whether they are called chrome cobalt or non-precious metal. The association is obvious, as something that is not precious cannot be good. However, non-precious dental metal alloys are among the most orally resistant, durable dental materials. Amann Girrbach has now introduced a procedure for processing chrome cobalt without water cooling in a benchtop milling machine. As the material is in a pre-sintered, wax-like state it can be processed very easily. In this article the exceptional dental technician Knut Miller demonstrates how to get the best quality from "chrome-cobalt restorations" with a little skill and knowledge of dental technology.

Knut Miller is a dental technician through and through. Someone who always wants to go one step further, who isn't easily satisfied and strives for perfection – in particular for natural aesthetics. This has already been demonstrated in his cult book "individualitas naturae dentis" in which he pays homage to the tooth shapes and their characteristics. It can be stated that this man understands his craft and has integrated the theory of morphology. *Knut Miller* now also works for Amann Girrbach. At Amann Girrbach he continually receives a very important product development from Research and Development to test the performance of the new material or new technique and say what he thinks has to be changed. One of these innovations was and is Ceramill Sintron; a CrCo sinter metal which is processed while still in a soft state and is therefore an interesting option for CAD/CAM in-house fabrication of chrome cobalt frameworks. *Knut Miller* and non-precious metal? Yes, this also comes as a surprise to you initially but after he had used the material briefly and became familiar with its remarkable properties, it became clear to him; chrome cobalt is his new gold.

Using a demonstration case he describes in the following article how he fabricates dental restorations from simple CrCo.

The demonstration case

Tooth 21 was to be treated in the demonstration with a fully veneered single porcelain crown. A partially veneered bridge was also to be fabricated from 24 to 27 with the abutment teeth 24 and 27. The two premolars were to be veneered with porcelain – tooth 24 with a porcelain shoulder in the proximal and vestibular region – and teeth 26 and 27 were to have a fully anatomical design. A full crown for tooth 27 was the crowning glory in the truest sense of the word. A Ceramill Sintron framework with a circumferentially reduced cervical margin was fabricated for tooth 21 to allow firing on of a porcelain shoulder (Fig. 1).

The anatomy, morphology and function can be fully customised and designed using the Ceramill Mind CAD software.

In this CAD working stage particular attention should be paid to the milling result of the occlusal surfaces etc. It should be noted, for example that the 0.6 mm fine cutter can mill details more efficiently, including the fissures. To ensure this the fissures in the CAD software should be opened slightly using the "Knife tip" modelling tool (Fig. 2a and 2b). Even if the manipulated details appear to be slightly "excessively wide", the fissures can be more easily defined by the cutter in this way – which optimises the milling result.

In addition, when contouring a functional occlusal surface of a fully anatomical restoration it should be noted that the restoration must always still be manually reworked (e.g. polished). The proximal and occlusal contacts should consequently be minimally over contoured to prevent the contact points being lost or creating infraocclusion after mechanical

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Fig. 1 The demo case: Porcelain veneered single crown on tooth 21 with shoulder preparation, a partially veneered bridge spanning teeth 24 - 27 as well as a fully anatomical crown on tooth 28 – all based on Ceramill Sintron.

preparation. These contact parameters can be easily and precisely defined and set in the Ceramill Mind CAD software. After dry milling of the Ceramill Sintron frameworks in the Ceramill Motion or Ceramill Motion 2, the restorations are separated using a conventional, cylindrical tungsten carbide cutter and the connector areas trimmed. Rubber polishers should not be used, as they could contaminate the metal that has not yet been fully sintered.

The unfired occlusal surfaces can now be easily and quickly customised and accentuated using conventional instruments (Fig. 3). Sculpting instruments are also sometimes used and are excellent for re-adjusting details. The wax-like consistency of the unfired framework greatly simplifies this process and makes the work a pleasure (Fig. 4a and b).

Care should be taken during manual preparation to ensure that the minimum thickness of the framework is not detrimentally affected, e.g. by the fissures being too deep or similar. The material shrinks by 11 percent during sintering (Fig. 5). After full sintering, the frameworks are prepared in the conventional way for the porcelain veneering and firing process. A separate instrument set (tungsten carbide cutter and/or ceramic bonded stones) is also recommended in this case for preparing the surfaces to be veneered.

The framework is then sandblasted using aluminium oxide grit size 110 µm and a

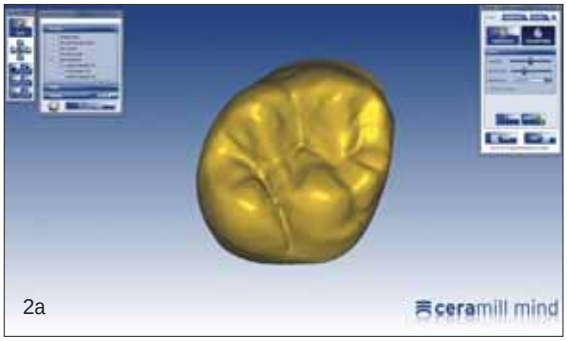

Fig. 2a and b The fissures are opened slightly to larger dimensions to ensure that the designed morphology can also be reproduced by the cutters. This appears a little exaggerated but balances out after full sintering.

Fig. 3a and 4a First step of customised reworking after dry milling in the Ceramill Motion/Motion2: Fissures and other details can be prepared in the unsintered state using a tungsten carbide cutter (old), which has been tapered using a diamond disc

Fig. 4b The junction of the fine fissures and details are prepared using a thin, conically tapered instrument (tungsten carbide or very fine diamond instrument) with a rounded tip

Fig. 5 In the left of the picture the bridge separated from the Ceramill Sintron blank before sintering and after sintering in the right of the picture. The material shrinks by 11 percent during sintering

pressure of 3 bar and then cleaned (Fig. 6). After the oxide firing, which is completed at a temperature of 980 °C and a hold time of 1 min., the oxide layer is sandblasted using aluminium oxide and opaque is applied to the cleaned framework. The porcelain powders are applied step by step after the opaque firing. The CTE of Ceramill Sintron is 14.5 (10-6/k) making it ideal for conventional bonding porcelains [1]. The porcelain is processed according to the manufacturer's instructions.

The author uses the thinnest round-head burs available and individually tapered tungsten carbide cutters for preparing the fully sintered metal occlusal surfaces. Finest grit diamond rotary instruments are also ideal for adjusting and preparing details of the morphology.

The author prefers to use different shapes of silicone rubber polishers and appropriate occlusal polishers for pre-polishing and high-lustre polishing as well as the Post Disc Fine polishers from the Ceramill Polish lab kit from Amann Girrbach (Fig. 7). Conventional brushes and metal polishing pastes (pre-polishing and high-lustre polishing pastes) are used for finishing (Fig. 8 to 16).

A very pleasant "side effect" when preparing Ceramill Sintron is the very easy polishing properties in comparison with a corresponding casting alloy. The reason for this is the low hardness.

The Vickers hardness of Ceramill Sintron is 280 (hv 10). In comparison the Vickers hardness of Girobond NB casting alloy from Amann Girrbach is 320 (hv 10) [2].

The slightly lower hardness of Ceramill Sintron, however, does not have any effect on the framework and connector design of the restoration. This means that Ceramill Sintron restorations have the same dimensions and design as usual.

Fig. 6 After full sintering, everything proceeds as usual. The Ceramill Sintron framework (here for tooth 21), which has been conventionally prepared and sandblasted using Al_2O_3, is ready for veneering

Fig. 7
Proven conventional silicone polishers are used for preparation; different hardnesses of tapered polishers are used for the occlusal areas. The Post Disc Fine from the Ceramill Polish lab kit (Amann Girrbach) is ideal for high-lustre polishing (far right)

Fig. 8
It can be stated that the method of producing such pictures is simply dental technology – this is also true

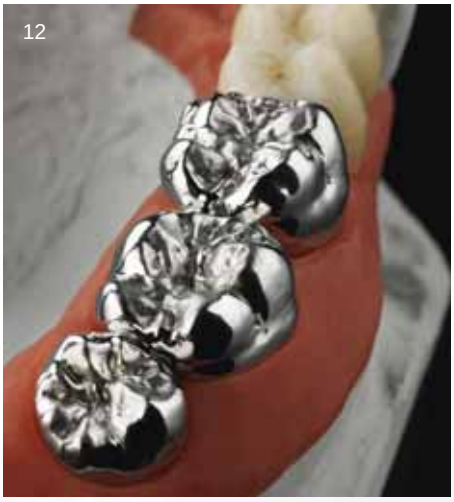

Fig. 9 to 13
To achieve such results using Ceramill Sintron requires a great deal of effort, skill and manual expertise. The occlusal surface was not polished to a high lustre but blasted with glass beads – as this article was intended to show what could be produced from a CrCo occlusal surface for demonstration purposes

The author is of the opinion that the good polishing properties of Ceramill Sintron are also due to the finer grain size of the alloy particles. On average they are about forty times (!) smaller than the grain size of a casting alloy. This makes the metal structure more homogeneous. There are also no types of inclusions or contraction cavities as can occasionally occur with casting alloys.

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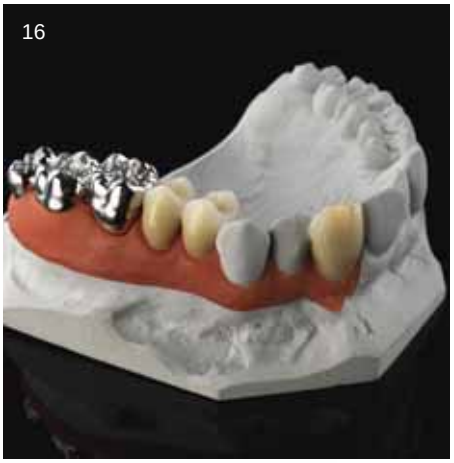

Fig. 14 to 16
If this involved a genuine clinical case and not a demonstration case as here, the occlusal surfaces of the fully anatomical crowns would have to be polished to a high lustre

Product list

Product	Name	Manufacturer/ Distribution
CAD/CAM system	Ceramill CAD/CAM	Amann Girrbach
Milling machine	Ceramill Motion 2	Amann Girrbach
Alloy, CrCo	Ceramill Sintron	Amann Girrbach
Scanner	Ceramill Map400 (or 300)	Amann Girrbach
Software	Ceramill Mind	Amann Girrbach

Notes and conclusion

In this demonstration case presented it should be taken into consideration that the author deliberately did not polish the occlusal surfaces to a high lustre but only sandblasted them using glass beads. According to the author this allows details to be photographed more effectively with a demonstration case. Ultimately the intention of this article is to demonstrate how wonderfully detailed CAD/CAM fabricated CrCo restorations can look, i.e. what is possible using Ceramill Sintron.

The author is absolutely aware that in a clinical situation the occlusal surfaces must be polished to a high lustre. Sandblasted, unpolished surfaces have micro-roughness, which would result in increased abrasion of the opposing teeth.

About the author

Knut Miller completed his training as a dental technician from 1984 to 1989. He attended further training in ceramics, gold and attachment technique as well as implant prosthetics. From 1996 to 1998 he was director and course instructor of the Amann Dental (now Amann Girrbach) Course Centre. He then worked for three years as a course instructor and lecturer for ceramic and Ceromeres in the ICDE of Ivoclar Vivadent in Schaan/ Principality of Liechtenstein. From 2001 to 2008 he was a freelancer and course instructor. In 2005 he published the reference book “individualitas naturae dentis – individualitas dentis naturae”, which was published in teamwork media Verlag. He took up the post of course instructor with Amann Girrbach in 2008. He has been self-employed since 2010 – but of course he still also works for Amann Girrbach.

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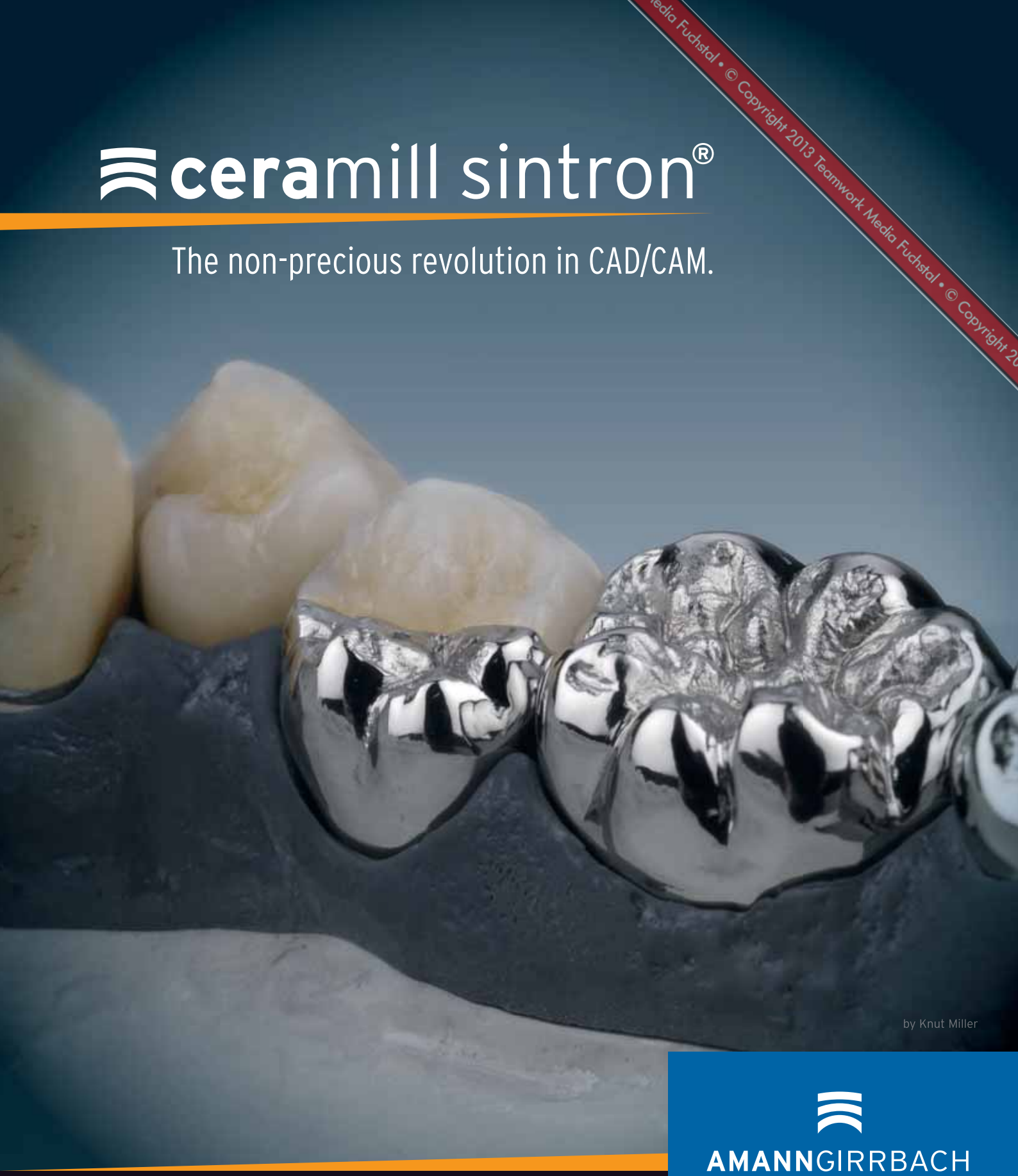

by Knut Miller

Ceramill Sintron® - discover online!

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