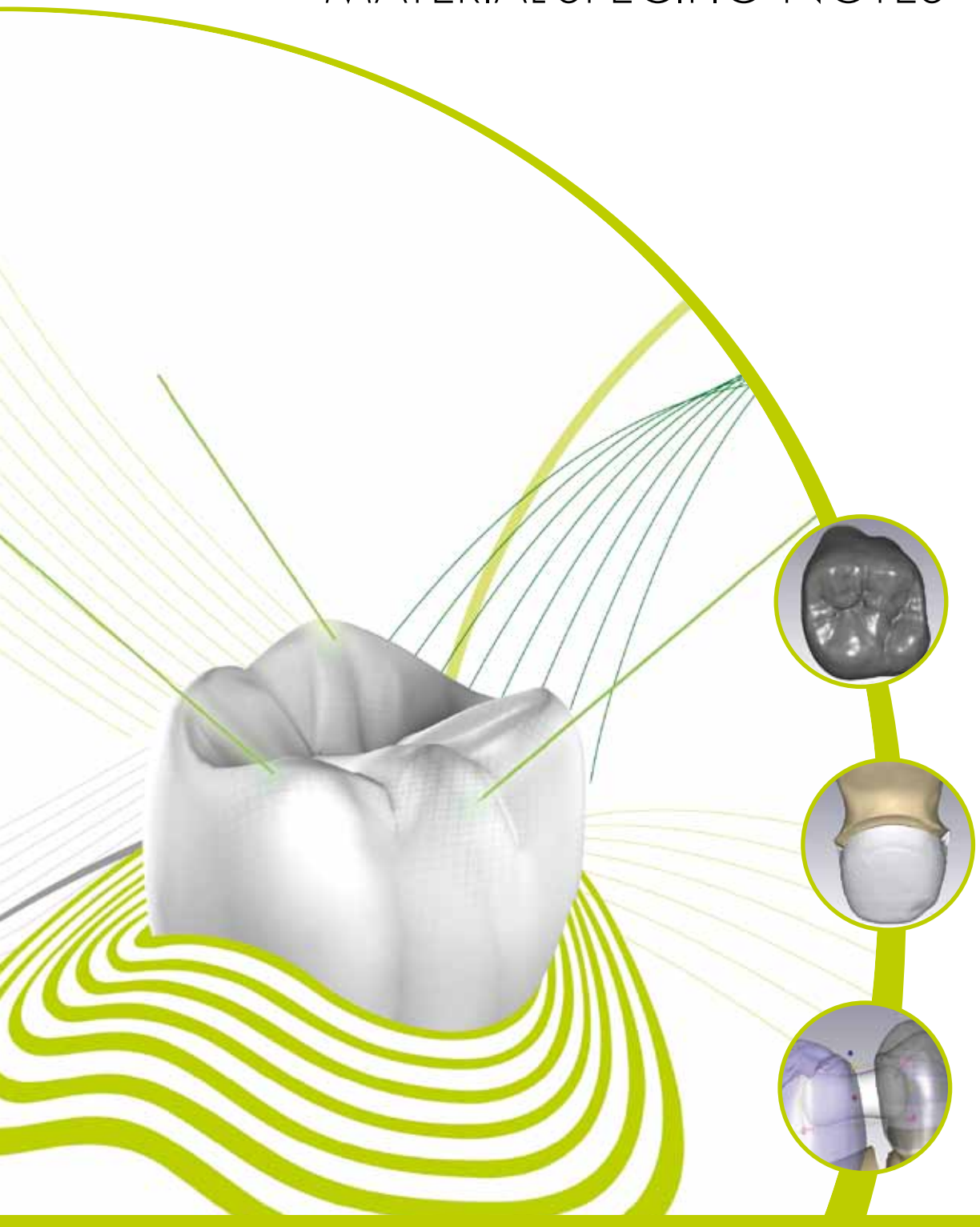
straumann

MANUFACTURING-SPECIFIC & MATERIAL-SPECIFIC NOTES



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CONTENT

1. MANUFACTURING NOTES

1.1 IPS e.max® CAD restorations by Straumann® CADCAM – lithium-disilicate glass-ceramic manufactured by Ivoclar Vivadent AG, Liechtenstein – Intended use and properties

IPS e.max® CAD restorations by Straumann® CADCAM are intended to be placed on natural teeth or on top of abutments to provide restorations such as copings, anatomic supported copings, cut-back crowns and full anatomic crowns. IPS e.max® CAD restorations by Straumann® CADCAM are made from lithium-disilicate glass-ceramic manufactured by Ivoclar Vivadent AG.

1.1.1 Information sessions on IPS e.max® CAD restorations by Straumann® CADCAM

Before you start processing IPS e.max® CAD restorations by Straumann® CADCAM, please ensure your participation in a Straumann® CADCAM information session including the presentation of the IPS e.max®[1] system.

1.1.2 Use and handling

IPS e.max® CAD restorations by Straumann® CADCAM are not sterile when delivered. The restoration needs to go through a standard disinfection or comparable cleaning process before being placed.

Material availability

The IPS e.max® CAD restorations by Straumann® CADCAM are available in following translucency/opacity range and shades.

Translucency / opacity	Shades / bleach
HT High Translucency	A1, A2, A3, A3.5, A4 B1, B2, B3, B4 C1, C2, C3, C4 D2, D3, D4 BL1, BL2, BL3, BL4
LT Low Translucency	A1, A2, A3, A3.5, A4 B1, B2, B3, B4 C1, C2, C3, C4 D2, D3, D4 BL1, BL2, BL3, BL4
MO Medium Opacity	0, 1, 2, 3, 4

Processing techniques

Depending on the processing technique and application, the following recommendation can be made to select the proper material:

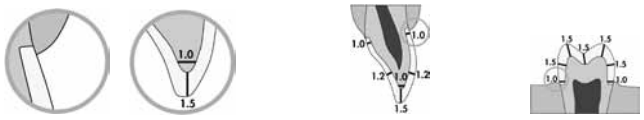
Translucency level	Processing techniques			Indications	
	Staining	Cut-back	Layering	Anterior crowns	Posterior crowns
HT High Translucency	•	•		•	•
LT Low Translucency	•	•		•	•
MO Medium Opacity			•	•	• *

** Up to premolar*

Tooth preparation

The tooth preparation guidelines recommended by Ivoclar Vivadent AG must be followed (see Figure 1).

Figure 1



Basic preparation guidelines | Anterior crown | Posterior crown

Finishing of the IPS e.max® CAD restorations by Straumann® CADCAM

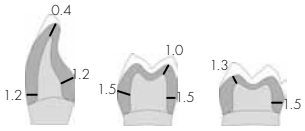
The IPS e.max® CAD restorations delivered by Straumann® CADCAM may need to be ground for finishing and adjusting observing the minimum thickness guidelines (see Figure 2).

Figure 2

Minimum thickness for the staining technique

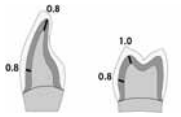
Anterior Premolar Molar

Minimum thickness for the cut-back technique



Anterior Premolar Molar

Minimum thickness for the layering technique



Anterior Premolar

For full anatomic crowns, surface-grinding of the entire occlusal surface with a fine diamond is recommended to smooth out the surface structure created by the CADCAM procedure. The restoration thickness guidelines must be followed (see Figure 2).

For copings, anatomic supported copings, cut-back crowns and manually reduced restorations, the following rules must be observed:

- The restoration thickness guidelines must be followed (see Figure 2).
- The IPS e.max® CAD restorations by Straumann® CADCAM must have enough support from the tooth shape.
- The IPS e.max® CAD restorations by Straumann® CADCAM must always make up at least 50 % of the total layer thickness of the restoration.

The recommended procedure to finish IPS e.max® CAD restorations by Straumann® CADCAM, as well as the recommended grinding instruments are described in the brochure "IPS e.max® CAD restorations by Straumann® CADCAM – Step by step instructions on the prosthetic procedures".

⚠ Caution

- Restorations must not be blasted with Al_2O_3 or polishing beads for finishing and adjusting the IPS e.max® CAD restorations by Straumann® CADCAM.
- It is of critical importance to use the correct grinding instruments for finishing and adjusting the IPS e.max® CAD restorations by Straumann® CADCAM.
- Apply appropriate precautions in order to prevent inhalation of grinding/polishing dust.

1.1.3 Processing

Different procedures can be followed to achieve the final restoration result:
a) Crystallization followed by staining & glazing
b) Crystallization followed by veneering & glazing
c) Crystallization and glazing (in one step)

The flexural strength of the IPS e.max® CAD restorations by Straumann® CADCAM is 130 ± 30 MPa. The crystallization has to be conducted in a firing furnace at ca. 850 °C (± 10 °C) (1562 °F ± 50 °F) during ca. 30 minutes (± 5 minutes) to reach its final flexural strength of 360 ± 60 MPa and its final optical characteristics (shade, translucency and brightness).

Important processing restrictions for the crystallization procedure

Failure to observe the following restrictions may compromise the results achieved with IPS e.max® CAD restorations by Straumann® CADCAM:

- Crystallization must be conducted in a ceramic furnace that has been calibrated and approved or recommended by Ivoclar Vivadent AG.
- Crystallization parameters defined by Ivoclar Vivadent AG must be followed.
- Use a firing paste for the crystallization. After the crystallization, do not remove firing paste residue with Al_2O_3 or polishing beads (use steam blaster and ultrasonic water quench).

Important processing restrictions for the veneering procedure

Strictly follow the guidelines and framework thicknesses (see Figure 2) to achieve successful results with IPS e.max® CAD restorations by Straumann® CADCAM.
For veneering the IPS e.max® CAD restorations by Straumann® CADCAM use the Ivoclar Vivadent IPS e.max® Ceram veneering material. The Ivoclar Vivadent AG instruction for use must be followed.

Further information is available in the brochure "IPS e.max® CAD restorations by Straumann® CADCAM – Step by step instructions on the prosthetic procedures".

1.1.4 Cementation

IPS e.max® CAD restorations by Straumann® CADCAM offer flexibility in cementation, as they can be seated adhesively, self-adhesively or conventionally, using suitable cementation systems for lithium-disilicate glass-ceramic. The instructions for use of the cement manufacturer of this material must be followed. The IPS e.max® CAD restorations by Straumann® CADCAM need to go through a standard disinfection or comparable cleaning process before being cemented.

Further information is available in the brochure "IPS e.max® CAD restorations by Straumann® CADCAM – Step by step instructions on the prosthetic procedures".

⚠ Caution

IPS e.max® CAD restorations by Straumann® CADCAM must not be blasted with Al_2O_3 or polishing beads when being prepared for cementation.

1.1.5 Chemical composition

Elements	Percentage
SiO_2	57 – 80 %
Li_2O	11 – 19 %
K_2O	0 – 13 %
P_2O_5	0 – 11 %
ZrO_2	0 – 8 %
ZnO	0 – 8 %
Others + coloring oxides	0 – 12 %

1.1.6 Specifications

	Before crystallization	After crystallization
Material	Lithium-disilicate glass-ceramic	
Density [g/cm^3]		2.5 ± 0.1
Vickers hardness HV	5400 ± 100	5800 ± 100
Flexural strength [MPa]	130 ± 30	360 ± 60
Fracture toughness [MPa $m^{0.5}$]	0.9 – 1.25	2.25 ± 0.25
Chemical solubility [$\mu g/cm^2$]	130 ± 30	40 ± 10
Modulus of elasticity [GPa]		95 ± 5
CTE (100 – 500 °C) [K^{-1}]		10.45 ± 0.25 10^{-6}
Crystallization temperature	850 °C (1562 °F)	

1.1.7 Contraindications and side effects

- Allergies or hypersensitivity to chemical ingredients of the lithium-disilicate glass-ceramic material (SiO_2, Li_2O, K_2O, P_2O_5, ZrO_2, ZnO, coloring oxides)
- Layering technique for molar crowns
- Very deep subgingival preparations
- Patients with severely reduced residual dentitions
- Bruxism

1.2 zerion™ – zirconium dioxide ceramic – Intended use and properties

The intended use spectrum of zerion™ ranges from single copings to primary crowns as well as wide-span bridges in the anterior and posterior regions. It owes its high strength and fracture strength to the tetragonal, polycrystalline framework structure.

Note
In the posterior region, a maximum of 2 pontics is to be placed between 2 bridge abutments.

1.2.1 Processing

The densely sintered ZrO_2 framework should only be processed mechanically if absolutely necessary. Only **water-cooled, diamond tools,** preferably ≥ 100 µm, should be used. Localized overheating may occur which will result in fissures in the material.

The following rules must be observed for finishing the frameworks:

- Do not drop below a wall thickness of 0.4 mm for copings according to the general guidelines for the use of full ceramic dental prostheses.
  The wall thickness for bridge structures should be at least 0.5 mm, and the cross- section of the connectors should be at least 9 mm^2. The cross-sections must be adjusted according to the situation with wide-span bridges.
- Do not use dry polishing tools!
- Use modern fine-grain diamonds for the careful reduction of edges and fine processing of surfaces.
- Use only diamond tools in excellent condition. A reduced cutting performance of the tool generates heat.
- The removal can be done with high rotational speed but with a low grinding pressure.
- The following must be avoided:
  – Grinding of the interdental connections
  – Subsequent separation with cutting discs, as this would initiate breaking points
  – Grinding indents into the framework
  – Sharp edges (round edges are essential).

Clean the ZrO_2 framework in an ultrasonic cleaner or with short steaming after processing.

Note
The height of the connectors is decisive for the tensile strength of the zirconium dioxide frameworks. Do not drop below the minimum height in the design of the connectors.

Through mechanical surface processing such as polishing and sandblasting (with Al_2O_3 or high luster sandblasting beads) critical amounts of energy may be added to the framework, which will result in damage to the surface structure. The deformation of the crystal lattice structure might cause a phase change of the ZrO_2 (tetragonal → monoclinic). A monoclinic structure has a lower CTE (app. 7×10^{-6}/K) than a tetragonal one.

Sandblasting of the veneering surfaces must be avoided. If mechanical processing of the framework is required, a final thermal treatment is recommended for the regeneration of the structure.

VT°C	→ min.	↗ min.	↗ (°C/min)
500	-	5.00	100

Temp. app.°C	→ min.	Vac
1000	15.0	-

⚠ Caution: No slow cooling

1.2.2 Veneering

All commercially available veneering ceramics that are intended for veneering of this material and that are suitable for a CTE value of 10 x 10^{-6}/K can be used.

Possible veneering ceramics:

- VITA VM® 9[2]
- GC® Initial Zr[3]
- VINTAGE® Zr[4]

The processing instructions of the veneering material manufacturers apply!

1.2.3 Cementation

Only materials that are suitable for zirconium dioxide and have been tried and tested in practice may be used for the cementation or fixation of the manufactured restoration. The luting material manufacturer is liable for the suitability of the material.

1.2.4 Chemical composition

Elements	**Percentage**
$ZrO_2 + Y_2O_3 + HfO_2$	≥99 %
Y_2O_3	4.5–5.4 %
Al_2O_3	<0.5 %

1.2.5 Specifications

Material	Y-TZP-A
Density [g/cm³]	≥ 6.00
Vickers hardness HV	≥ 1200
Flexural strength (3-point bend) [MPa]	1200
Compressive strength [MPa]	≥ 2000
Average particle size [µm]	≤ 0.6
Modulus of elasticity [GPa]	210
CTE (20–500°C) [K^{-1}]	10 x 10^{-6}

1.2.6 Contraindications and side effects

Patients with known hypersensitivity to zirconium dioxide should not wear dental frameworks made from zerion.

⚠ Caution

Airborne particles will be released during grinding. Dust respirator and safety goggles must be worn. Safety pane and extraction are mandatory.

1.3 ticon® – titanium – Intended use and properties

ticon® is grade 2 type titanium. The chemical composition of ticon® is designed for high biocompatibility.

The material properties of ticon® are preserved through CAM processing of the industrially manufactured titanium blanks. Structural material changes, which may easily occur in the conventional casting process (e.g. through porosities, inclusion of foreign material or wrong temperature control), can be completely eliminated through cold processing.
The detrimental oxide layer (α-case layer) that forms on the unit's surface during the casting process is not formed during the milling process! Thus an excellent compound structure between titanium and the appropriate veneering porcelain is accomplished.

1.3.1 Processing

Only special titanium carbide cutters may be used to process the machine milled frameworks. Unidirectional grinding, moderate rotational speed (max. 15,000 rpm), as well as low grinding pressure are required. Material overlaps should be avoided. If necessary, reduce the grinding pressure and/or rotational speed.

All veneering surfaces must be smooth finished; the following design and preparation of the titanium framework must be strictly observed for the subsequent veneering process:

- Do not drop the coping thickness to below 0.5 mm (with bridge abutments 0.6 mm)
- The cross-section of the crown/pontic connectors must be at least 5 mm^2.
- The cross-sections must be adjusted according to the situation with wide-span bridges.
- After finishing, sandblast the framework surface with pure aluminum oxide (granulation: 110 to 150 µm) at a pressure of max. 2 bar.
- Subsequently allow the framework to rest for 5 min (=> passivation of the surface) and then steam clean afterwards (in no case with ultrasound or acid bath treatment).
- After this final step the framework should no longer be touched with the fingers.

1.3.2 Welding

It is important to observe the geometry, surface structures, welding sequence, and welding parameters recommended for each individual device during laser welding. Suitable additional material may be required. Always adhere to the recommendations of the device manufacturer.

Note

We do not recommend titanium/precious metal or titanium/NPM combination weld seams.

1.3.3 Polishing

The finished surfaces can be brightly polished with commercially available polishing compounds or with diamond polishing paste. The polish improves the condition of the finished surface. To prevent smudging, use a moderate rotational speed and low pressure during polishing. Polishing residue is to be removed with an ultrasound cleaner or steam jet.

1.3.4 Veneering

All commercially available bonding ceramics that are intended for veneering of this material and that are suitable for a CTE value of 9.6 x 10^{-6}/K can be used.

Possible veneering ceramics:

- TiKrom[6]
- Triceram®[7]
- VITA® titanium ceramics[2]
- GC® Initial Ti[3]

The processing instructions of the porcelain material manufacturers apply!

1.3.5 Chemical composition

Elements	**Percentage**
Ti	≥ 99.3 %
N	0.03 %
C	0.1 %
H	0.0125 %
Fe	≤ 0.3 %
O	≤ 0.25 %

1.3.6 Specifications

Color	silver
Material	Grade 2 titanium
Melting point [°C]	1670
Condition	annealed
Solubility in H_2O [mg/l]	insoluble
Density [g/cm^3]	4.5
Yield strength $R_{p0.2}$ [MPa]	325–395
Tensile strength R_m [MPa]	460–475
Elongation at break A_5 [%]	30–35
CTE (25-500°C) [K^{-1}]	9.6×10^{-6}

1.3.7 Contraindications and side effects

Patients with known hypersensitivity to titanium must not wear dental frameworks made from this material.

⚠ Caution

Titanium dust and particles are highly flammable! Sufficient safety measures must therefore be taken. (e.g. no smoking during grinding, no open flames, etc.). If titanium dust or vapors are generated, safety panes, goggles, respirator and exhaust must be used.

1.4 coron® – cobalt-chromium alloy – Intended use and properties

The CoCr alloy coron® is used in the machine processing of dental prostheses, such as crowns and bridges for the anterior and posterior region. coron® is a cobalt-based non-precious dental alloy type 4 according to ISO 22674 for all high-melting ceramics.

The material properties of coron® are preserved through the CAM processing of the industrially manufactured non-precious metal blanks. Structural changes of the material, which can easily occur in the conventional casting process (for example through inclusion of foreign material or wrong temperature control), can be completely eliminated with cold processing. Thus an excellent compound structure between coron® and the appropriate veneering ceramics is accomplished.

1.4.1 Processing

For the framework design and preparation:

- Do not drop below a coping wall thickness of 0.25 to 0.3 mm.
- The cross-section of the connectors must be at least 5 mm^2. The connector height is decisive for the overall stability. The cross-sections must be adjusted according to the situation with wide-span bridges. The transition from connector to crown or coping must be rounded.
- During the design phase, insufficient material should be compensated with the framework material rather than with the veneering ceramic.
- Sharp edges, tips and thinly peaked edges should be avoided.
- The surfaces to be veneered with ceramic are to be processed with coarse and fine, sharp, tungsten carbide cutters.
- The surface should always be processed in the same direction to avoid overlaps of the material.
- Sandblast the finished framework with a one-way sandblast abrasive (Al_2O_3) with a medium grain size of 125 µm at a maximum pressure of 2 to 3 bar and clean with hot steam
- The cleaning should be done with distilled water in ultrasound or with ethyl acetate. Do not immerse coron® frameworks into a pickling bath

Metal crowns and occlusal surfaces may be covered with fine aluminum abrasive bodies prior to buffing and high gloss polishing to attain smooth and even transitions.

Note

Material overlaps as well as the use of silicon carbide abrasive tools may lead to the formation of air voids during the ceramic firing.

1.4.2 Soldering and welding

Ensure that a solder and flux are used with suitable constituents and melting temperature for the alloy to be soldered.

Caution

Soldering **after the ceramic firing** is not recommended due to the reduced corrosion resistance and lower diffusion of the precious metal solder with the NPM alloys. Other joining techniques such as laser or TIG welding are expedient. Laser welding will be done with the according same grade laser welding wire.
Soldered frameworks must be cooled slowly after the ceramic has been fired.

1.4.3 Veneering

All commercially available bonding ceramics that are intended for veneering of dental cobalt-chromium alloys and that are suitable for a CTE value of 14.4 x 10^{-6}/K can be used.

An oxide firing **or control firing** is **not required** for ceramic veneering due to the exclusion of casting faults, inclusions and blowholes. If an oxide firing is carried out however, then select 10 minutes at 980 °C in air (no vacuum).

Note

- The thickness of the veneering ceramic must be even and not exceed 2 mm.
- The surface must be cleaned thoroughly by brushing it with distilled water after each ceramic firing to remove soluble oxides.
- When using opaquer containing titanium dioxide, it should be noted that the titanium dioxide and chromium from the alloy may form a yellowish green pigment and thus result in discolorations at the margin.
- The higher modulus of elasticity of coron®, in comparison to PM alloys results in greater tensions in the NPM alloy-ceramic compound. This special circumstance must be taken into account for large-span units, with delayed cooling off in the sense of slow cooling, or rather expansion cooling, after the firing according to the instructions of the veneering ceramics manufacturer.

Repeated firings and longer resting time in ceramics ovens may possibly increase the CTE value of the ceramic. The result is tensile stresses in the ceramic, which can lead to fissures. All firings – except opaquer firings – should be exposed to slow cooling.

Possible veneering ceramics:

- HeraCeram®[8]
- VITA VM® 13[2]
- VITA Omega® 900[2]
- CARMEN®[7]
- CCS[9]
- GC® Initial MC[3]

The processing instructions of the veneering material manufacturers apply.

1.4.4 Chemical composition

Elements	Percentage
Co	60.5 %
Cr	28 %
W	9 %
Si	1.5 %
Additional elements below 1 %	Mn, N, Nb, Fe

1.4.5 Specifications

	Without thermal treatment	**After thermal treatment**
Color	silver grey	
Material	NPM alloy	
Density [g/cm^3]	8.3	
Solubility in H_2O [mg/l]	insoluble	
Yield strength $R_{p0.2}$ [MPa]	380	460
Vickers hardness HV10	260	
Elongation at break A_5 [%]	2.2	5.1
CTE (25 - 500 °C) [K^{-1}]	14.4 x 10^{-6}	

Solidus temperature [°C]	1320
Liquidus temperature [°C]	1420

1.4.6 Contraindications and side effects

Symptoms of intolerance to the non-precious alloy coron™ are very rare if the processing guidelines are correctly observed.

If the patient has a known allergy to any component within the alloy, this alloy must not be used for safety reasons.
Isolated patient cases have shown local irritation caused by electrochemical reactions.
Galvanic effects may occur if different alloy groups are used.

⚠ Caution

The fine metal particles can affect sensitive skin and must not be inhaled. Face mask and safety goggles must be worn. Always use safety pane and extraction.

1.5 Polyamide – Intended use and properties

The polyamide which is reinforced with short parallel glass fibers is versatile; it may be appropriate to use it for example for non-metal restorations for patients with allergies, for temporary dentures, and for crown and bridge prostheses. Biocompatibility and compound stability with the use of light-curing composites are confirmed by studies*.
The material properties are preserved during CAM processing.

1.5.1 Processing

A maximum rotational speed of 20,000 rpm must be observed during processing with carbide tools in order to prevent smearing.

For the framework design and preparation:

- Do not drop below a coping thickness of 0.5 mm, with bridge abutments 0.6 mm
- The cross-section of the crown/pontic connector must be at least 9 mm^2; with wide-span bridges the cross-sections must be adjusted to the situation.
- The connection of polyamide and veneering synthetic is clearly improved by adding undercuts (additional retention).
- After finishing, sandblast the crown surfaces with pure aluminum oxide (granulation: 110 to 150 µm) at a pressure of max. 2 bar
- After sandblasting the surfaces should no longer be touched with the fingers. Steam cleaning is not necessary.
- Silane conditioning is required to ensure a secure compound of polyamide and facing synthetic.

Note

To significantly improve aesthetics at the marginal region of polyamide crowns, it is possible to design the margin region analogous to a ceramics shoulder made of metal ceramics. However, a groove preparation or shoulder preparation is required. The reduction of the polyamide framework must not exceed 1 mm. Margins which are too short due to finishing mistakes can also be corrected without problems by adding composite.

1.5.2 Veneering

Possible veneering materials:

- Artglass®[8]
- VITA ZETA® LC[2]
- VITA VM® LC[2]
- Solidex®[4]
- CERAMAGE®[4]
- Tescera®[11]

The processing instructions of the veneering material manufacturers apply!

Note

The polyamide frameworks must be veneered before being placed into the patient's mouth.

1.5.3 Chemical composition

Fiberglass-reinforced copolyamide, modifiers

1.5.4 Specifications

Color	Light green – gray
Material	Polyamide (DC-Tell)
Solubility in H_2O [mg/l]	insoluble
Flexural strength [MPa]	380
Modulus of elasticity [GPa]	22
Melting point [°C]	260
Density [g/cm^3]	1.69
	radiolucent

1.5.5 Contraindications and side effects

Patients with known hypersensitivity to components of polyamide must not wear dental frameworks made from polyamide.

Caution

Grind and polish only while wearing safety goggles and gloves; respiratory protection and extraction systems are required!

** Prof. Dr. H. F. Kappert, University of Freiburg, Germany, and Prof. Dr. Henning, Dental Engineering, Basel, Switzerland, ISO 10477*

1.6 polycon® ae – tooth-colored polymethyl methacrylate – Intended use and properties

The IPN* plastic polycon® ae is a product used in the machine processing of dental prostheses, such as crowns and bridges in the anterior and posterior region.

polycon® ae offers biocompatibility and color stability as well as excellent compound stability with non-ceramic veneering materials. The material properties of polycon® ae are preserved through CAM processing of the industrially manufactured plastic blanks.

1.6.1 Processing

The finished machined framework must be adjusted with tungsten carbide cutters for plastics. A maximum rotational speed of 20,000 rpm must be observed during finishing in order to prevent smearing. A high build up of heat must be avoided during the work-up and subsequent polishing to prevent an inaccurate fit in the framework production.

For the framework design and preparation:

- Do not drop the coping thickness below 0.5 mm, with bridge abutments 0.6 mm
- The cross-section of the connectors must be at least 9 mm^2. The connector height is necessary for overall stability. With wide-span bridges the cross-sections must be adjusted to support the framework.
- The transition from connector to crown or coping must be rounded.
- Restoration: Crown and bridge frameworks made of polycon® ae, can be restored and adjusted at any time with all commercial MMA-based cold polymerisates.

Note

To improve aesthetics at the margin region of the crown it is possible to design the region analogous to a ceramic shoulder made of metal ceramics. However, a groove preparation or shoulder preparation is a necessity. The reduction of the PMMA framework must not exceed 1 mm. Edges which are too short due to finishing mistakes can also be amended without problems.

Caution

A span width of more than one pontic is not recommended for the construction of bridges.
It must be determined in individual cases if the PMMA – IPN material ensures sufficient chewing stability through selection of the appropriate cement. Otherwise, an alternative material (composite) must be used for veneering.

1.6.2 Veneering

A milled PMMA framework can be coated with commercial veneering materials. Preference should be given to PMMA-based materials. The applied layers form a secure and lasting compound, if the connections were previously abraded with suitable agents. Coarse small grinding stones or diamonds are suitable agents. For veneering with composites, bonding with PMMA must always be in accordance with the pertinent manufacturer's recommendation.

1.6.3 Attachment options in the mouth

Temporary prosthesis: temporary cements
Long-term temporary prosthesis: glass ionomer cements without bonding
Definitive prosthesis: adhesive bonding technique with suitable cements, e.g. artCem® GI[12] or GC Fuji PLUS®[3]

**IPN = Highly cross-linked Interpenetrated Polymer Network A PMMA based acrylate plastic, with high strength and good abrasion values due to molecular cross-linking.*

1.6.4 Chemical composition

Polymethyl methacrylate
Other Polymethacrylates
Titanium dioxide
Pigments

Max. 2 % of methylmethacrylate may be contained as a residual monomer

1.6.5 Specifications

Color	tooth colored (B1)
Material	PMMA
Density [g/cm³]	1.19
Solubility [µg/mm³]	0.2
Flexural strength [MPa]	83
Water absorption [µg/mm³]	26.5
Water solubility	insoluble
Solubility (qualitative)	Poorly soluble in organic solvents
Flash point [°C]	> 250
Ignition temperature [°C]	> 400

1.6.6 Contraindications and side effects

The material must not be used in patients with a known hypersensitivity to a component of polycon® ae.

⚠ Caution

The processing of polycon® ae results in small particles which may lead to irritation of eyes, skin and air passages. Grind and polish only when using safety goggles, respiratory protection and extraction systems!

If polymer dust develops, ensure adherence to the general dust limit and wear a fine particulate mask with a particle filter FFP.

1.7 polycon® cast – burn-out resin – Intended use and properties

polycon® cast is a filler-free acrylic glass, and represents an alternative to standard crown and bridge waxing in the casting technique. The PMMA synthetic which can be burned out without residue can be used instead of modelling wax. polycon® cast is versatile; it may be used for example in the veneering and full cast techniques or for telescopic crowns and attachments.

1.7.1 Processing

The machine milled cast units should be finished with tungsten carbide cutters for synthetics. A maximum rotational speed of 20,000 rpm must be observed in order to prevent smearing. A high build-up of heat while working must be avoided to preclude an inaccurate fit during framework production.

For the cast unit design and cast preparation:

- Do not drop below an individual coping thickness of 0.25 mm, with bridge abutments 0.3 mm
- The cross-section of the connection elements must be adjusted to the situation and the casting alloy to be used. The connector height is decisive for the overall stability.
- The transition from connector to crown or coping must be rounded.
- The occlusion must be checked with full cast crowns, if necessary.
- The machine milled cast units can subsequently be enhanced with direct application of modelling wax.

Note

Burn-out synthetics tend to swell slightly during burning out. It is therefore recommended to reduce the edges of the crown by about 1 mm and fill it with cervical wax (or other commercially available modelling wax).
A light overall wax cover also creates swelling space in the muffle.

- The casting sprues are to be attached in the regular manner and according to the alloy. Please adhere to the indications for the investment compound and the instructions of the alloy manufacturer for this process!
- Attach the casting units to the sprue former and follow the directions of the investment compound manufacturer.

Note

The use of investment compounds for the rapid heating method (speed investment compounds) is not recommended. The investment compound may tear due to the rapid expansion of the synthetic during attachment of the casting muffle in the hot pre-heating oven.

1.7.2 Chemical description

Polymethyl methacrylate

1.7.3 Specifications

Color	colorless
Material	PMMA
Density [g/cm^3]	1.19
Modulus of elasticity [MPa]	3300
Flexural strength [MPa]	115
Brinell hardness $H_{961/30}$ [MPa]	175
Elongation at break [%]	5.5
Moulding temperature [°C]	160 – 175
Max. long-term usage temperature [°C]	80
Ignition point [°C]	425
Transverse contraction μ_b (with a strain rate of 5% per min, up to a strain of 2% at 23 °C)	0.37
Vicat softening temperature [°C]	115
Water solubility	insoluble
Water absorption (24h, 23 °C) at dry condition; test piece 60 × 60 × 2 mm^3 [mg]	41

1.7.4 Contraindications and side effects

Does not apply.

⚠ Caution

polycon® cast is not to be inserted into the patient's mouth to check the fit.

polycon™ cast is not a medical device!

⚠ Caution

The processing of polycon® cast results in dust which may lead to irritation of eyes, skin and air passages. Polish only while wearing safety goggles; respiratory protection and extraction systems are required.

2. IMPORTANT INFORMATION

2.1 Patient-related

Contraindications
Like with all chemical materials, allergic reactions to the dental materials described in this brochure cannot be excluded totally.
Frameworks must not be used in patients who have a known allergy to one or more components of the respective framework material.

Interactions
With the use of different alloy groups Galvanic effects may occur.

2.2 Laboratory-related

Health hazards
Particles that are generated during machine processing, as well as grinding and polishing dusts must be extracted with suitable ventilation systems. Sufficient protective clothing must be ensured (safety goggles, dust mask, safety pane).

2.3 Disclaimer

Straumann® products must be used in accordance with Straumann's instructions. Improper use or handling of the company's products will void the warranty, if any, accompanying the company's products. Improper handling includes, but is not limited to the use of the company's products with third party parts or components. If you would like additional information on the proper use of Straumann's products, you should contact your local Straumann distributor.

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3. CONCLUSION

Some of the products and/or materials listed in this brochure are not available in all countries. For detailed information please contact your local Straumann® representative.

Due to the on-going advances in CADCAM technology, materials and indications, this manual will be edited on a regular basis.

Updated versions of this manual will be available by updates of your etkon™_visual sofware. The previous version loses its validity upon receipt of the updated version.

Our technical helpline can help you individually and competently and answer questions not covered in this manual.

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The user is obliged to study the latest developments of the Straumann® Dental Implant System, Straumann® CADCAM products and other Straumann® products and their applications regularly.

Please note
The descriptions contained in this document are not sufficient for immediate use of the Straumann® Dental Implant System, Straumann® CADCAM products or other Straumann® products. Knowledge of dental implantology and instruction in the handling of the relevant Straumann® product provided by an operator with the relevant experience are always necessary.

Availability
Some of the products listed in this brochure are not available in all countries.

Validity
Upon publication of this brochure, all previous versions are superseded.

Caution
In addition to the caution notes in this basic information, Straumann® products must be secured against aspiration when used intraorally. Do not use damaged or blunt instruments.

Units per package
Unless stated otherwise, there is one unit in each package.

Documentation
For detailed instructions on the Straumann® Dental Implant System, Straumann® CADCAM products, or other Straumann® products contact your Straumann representative.

Copyright and trademarks

Explanation of the symbols on labels and instruction leaflets

LOT	Batch code
REF	Catalogue number
STERILE R	Sterilized using irradiation
	Lower limit of temperature
	Upper limit of temperature
	Temperature limitation
Rx only	Caution: U.S. Federal law restricts this device to sale by or on the order of a licensed dentist.
	Do not re-use
	Non-sterile
	Caution, consult accompanying documents
	Use by
	Keep away from sunlight
CE	Straumann Products with the CE mark fulfill the requirements of the Medical Devices Directive 93/42 EEC
CE 0123	
	Consult operating instructions

Colored warning labels

YELLOW = CAUTION	Indicates hazards or unsafe handling which might cause minor injury or damage to property
ORANGE = WARNING	Indicates hazards which might cause serious or fatal injury
RED = DANGER	Indicates hazards which might cause immediate serious or fatal injury

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