for 2 press SYSTEM

BioHPP – The new class of materials

in prosthetics

Physiological, aesthetical, durable

bredent

Why use a new material?

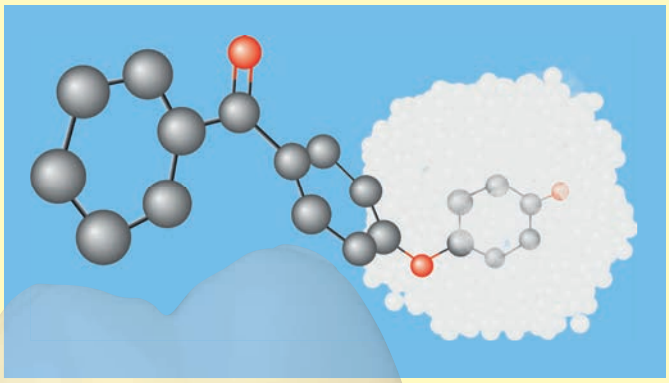
Gold casting alloys, cobalt-chrome casting alloys and titanium are the most accessible and well-known materials used for the manufacture of framework structures today.
In the last 15 years, zirconium dioxide has become processable due to the CAD/CAM technique and has pushed significant numbers of metallic alloys off the market. In order to be able to process the zirconium dioxide, dental technicians had to master a new technique and make major investments in software and hardware. Manufacturing is increasingly carried out in milling centres today, meaning that there is a stronger price war for this material and the dental prosthesis manufactured from it.

BioHPP is a material based on PEEK (polyetheretherketone), which has already been successfully used in operations carried out on humans for many years. Thanks to its excellent stability, its optimal polishable properties and its low plaque affinity, **BioHPP** is particularly well suited for producing high-quality prosthetic restorations.

The elasticity of the material, which lies within the range of bone, makes it a more natural material, as it is able to compensate for the torsion of bone, in particular in the case of larger implant work. The aesthetic white shade supports its use in the field of prosthetics.

Its insolubility in water makes it a biocompatible material, which is ideal for patients with allergies.

High-performance polymers have a great potential as framework material, both for fixed and removable dental prostheses. On the one hand, they are considerably cheaper than gold and on the other hand, they are lighter and easier to work with in dental laboratories compared to NPM, titanium or ceramics. Moreover, demand for metal-free dental prostheses is on the increase, with more and more cases of metal intolerance.



Structural formula of a PEEK molecule. The white cloud indicates the ceramic filler, which is responsible for the high mechanical material properties, especially for dental technical use.

The initial PEEK material

For more than 30 years, PEEK has been used in human medicine as an implant material (finger prostheses, intervertebral discs and hip joint prostheses). The benefits lie in the highly biocompatible material properties, which make fusion with the bone possible. What is more, the mechanical material properties are very similar to that of the bone skeleton.

As a rule, PEEK is used in medicinal products, in order to achieve greater benefits: in order to make a product lighter, have a higher level of design freedom and a higher level of functional integration on the one hand, but also as a cheaper alternative to precious metal or other materials, on the other hand. Its performance characteristics include biocompatibility, chemical stability, resistance to gamma and X-ray radiation and radiological transparency (no production of artefacts).

PEEK (polyetheretherketone) is the most significant representative of polyaryletherketone (PAEK). This is a partially crystalline, thermoplastic high temperature-resistant high-performance plastic with a melting temperature of approx. 334°C. PEEK is therefore suited for processing in extrusion and injection moulding procedures, but can also be used to manufacture tense rotating parts and milling parts. The material is highly stable and can bear pressures of up to 3.6 GPa.

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The material properties of BioHPP

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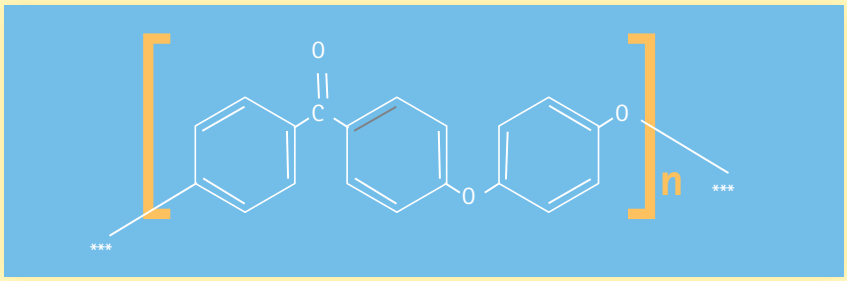


Chemical structure formula of the PEEK molecule.

- Used as implant material for over 30 years in human medicine
- Reinforced with ceramic particles, partially crystalline thermoplastic for extreme stress
- Metal-free
- Not abrasive for the remaining teeth
- White shade
- Can be veneered with traditional veneer composites (e.g. visio.lign)
- Class IIa medicinal product

- Long-term experience has been gained
- The material is suited as framework material
- No exchange of ions in the mouth, no discolouration
- The enamel of the opposite teeth is protected
- Can be used fully anatomically
- High aesthetics and customisation
- Permanent dental prosthesis

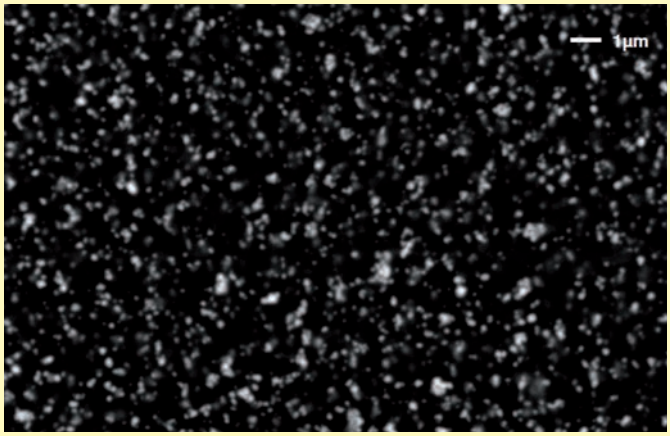
Photo: Giuseppe Leonetti, Turin/Italy.
Front teeth in the maxilla from BioHPP veneered with the veneer plastic of the visio.lign system.

What is so special about BioHPP

BioHPP (High Performance Polymer) is a PEEK variant that has been specially optimised for the dental field. Thanks to strengthening with a special ceramic filler, optimised mechanical properties have been created for dental technical and/or dental medical use in the crown and bridge area.

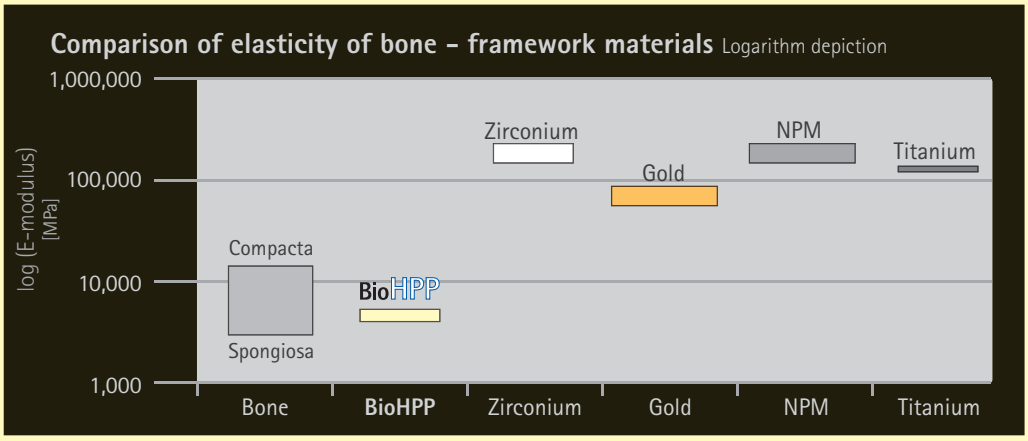
This ceramic filler has a grain size of 0.3 to 0.5 µm. Due to this very small grain size, constant homogeneity can be produced. This homogeneity is an important prerequisite for these outstanding material properties and forms the basis for consistent quality.

The fine granularity of the filler is the basis for the extremely good polishing properties that emerge later. The deposit of plaque is prevented and the degree of discolouration is reduced due to the fact that the surfaces are polished to a high shine.



Surface of **BioHPP** enlarged 1000 times.

BioHPP bridge veneered with visio.lign composite - which enables direct contact on the gingiva thanks to the highly polished garlands. Gum irritation is avoided thanks to this surface quality.



In contrast to the framework materials previously used, **BioHPP** has an elasticity that is suited to the bone. Ceramics and NPM are approximately 20 x as rigid as bone, and gold and titanium are 10 x as rigid as bone. This similarity to bone has a beneficial effect, especially in wide-span framework structures.

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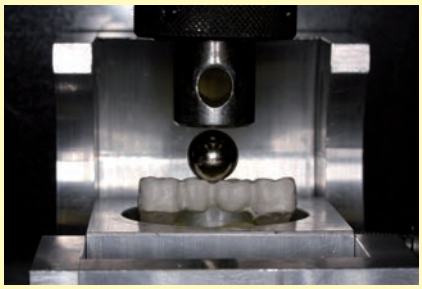
BioHPP in clinical and scientific studies

Knowledge of the mechanical properties of a material is important in order to be able to determine the envisioned indications from it. The E-modulus, the maximum fracture resistance, the bond strength and the polishing properties are crucial factors in this case.

In cooperation with Jena University (Outpatient Department for Dental Prosthetics and Materials) and Regensburg University (Specialist field of Dental Prosthetics), **BioHPP** was scientifically and clinically assessed during in vitro tests with regard to the aforementioned material properties.

Elasticity modulus

The E-modulus of **BioHPP** lies in the range of 4000 MPa, which very strongly resembles the elasticity of human bone (e.g. in the mandible). The chewing forces are therefore cushioned, even with implant-supported bridges.



The trial structure for the break load in the universal test machine "Zwick". The compression forces are applied using a metal stud in the centre of the pontics.
Source: Regensburg University, Outpatient Department for Dental Prosthetics.

Fracture resistance

The maximum fracture resistance indicates the force - measured in Newtons - at which the sample fails (4-part bridge on human stumps in our trial structure). Values of up to 1200 Newtons were reached during this test, which, in comparison to a maximum chewing force of 500 Newtons for a human bite, represents an adequate safety margin.

4-part bridge made from **BioHPP** veneered with visio.lign with mobile socket with vario-link II prior to the chewing simulation test.

Source: Regensburg University, Outpatient Department for Dental Prosthetics.

Bond strength

With the bond strength it is crucial that the framework can be veneered with all traditional veneer composites. The advantage here is that bond strengths of over 25 MPa are achieved using the adhesive visio.link, whereas the required standard value according to DIN EN ISO 10477:2004 is a max. 5 MPa.

The use of visio.link as an adhesive with veneer composites from other systems is also crucial for the high level of adhesion.

Plaque resistance

The polishing properties of **BioHPP** are of eminent importance. These properties counteract plaque deposits and discolouration even in exposed surfaces and framework structures. Gum irritation is ruled out due to the surface quality of the material and its low rough depth of 0.018 µm R_A (Jena Uni) .

The polishing properties of the veneer composite and of the **BioHPP** as fully-anatomical chewing surfaces are so good that a rough depth in **BioHPP** of only 0.018 µm R_A can be achieved.

Advantages and benefits of BioHPP

Reproducible manufacturing process

Advantage – Consistent quality thanks to an automatic and electronically-monitored pressing procedure

Benefit – Consistent material properties and avoidance of complaints

Shock-absorbing effect (so-called off-peak)

Advantage – Protection of the implant against high chewing loads

Benefit – Durability and increased wearing comfort for the patient

Abrasion-resistant tooth-like material

Advantage – Chewing surfaces keep their shape over long periods of use

Benefit – Increased quality of life

White framework material that can be veneered

Advantage – Can be veneered individually with composite veneers

Benefit – Enables individual adjustment to the remaining teeth and prevents chipping

Low density (1.3 to 1.5 g/cm³)

Advantage – Very simple dentures

Benefit – Increases wearing comfort for patients

Steady friction in connecting elements

Advantage – Prevents loss of friction

Benefit – Increases wearing comfort and saves on replacing the dentures with new ones

Homogeneity

Advantage – Equally distributed filler in the partially crystalline polymer matrix

Benefit – Manufacture of permanent dentures (MPG Cl. IIa)

Biocompatibility

Advantage – No substances that are not compatible with the body, such as metals or residual monomers are released

Benefit – Offers dental prostheses that are compatible with the body and healthy

Material-specific properties of BioHPP

Mechanical properties according to ...

DIN EN ISO 10477

E-modulus	–	4,000 MPa
Flexural strength (no material failure)	–	>150 MPa
Water absorption	–	6.5 µg/mm³
Water solubility	–	< 0.3 µg/mm³

Thermocycling 10,000 cycles 5°C / 55°C in accordance with DIN EN ISO 10477

E-modulus	–	4,000 MPa
Flexural strength	–	>150 MPa (no material failure)

Breaking load tests on 3-part bridges

Maximum load without failure (after 24 hr immersion in water, 37°C)	–	>1,200 N
Maximum load without failure (after mechanical and thermal alternating load 1.2 million x 50 N, 10,000 x 5°C / 55°C)	–	>1,200 N

Other properties

Melting range (DSC) – approx. 340°C

Bond strength > 25 MPa
combo.lign

Thickness – 1.3 to 1.5 cm³

Hardness (HV) – 110
HV 5/20

6-part anterior bridge with a very high-quality aesthetic veneer.

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BioHPP BioHPP processing

BioHPP when processing in the *for* 2 press System

The **BioHPP** is processed in the *for* 2 press vacuum press device. The entire injection process is completed fully automatically. A blue LED light marks the end of the process.

In order to be able to exploit the material properties as much as possible, the initial material must be processed in a procedure especially developed for this purpose.

The initial situation is a wax model, which is invested in a mould with an investment material especially developed for this purpose. This mould is heated to between 630°C and 850°C in a pre-heating oven, the wax is melted away and then cooled at 400°C. At this temperature, **BioHPP** is brought to the melting range of this investment material mould and melted down. The insertion of the press plunger and transfer of the mould into the *for* 2 press system then takes place. By raising the lift, the pressing procedure is triggered automatically and takes place in a vacuum. After completion of the vacuum, the mould is cooled down to room temperature within 35 minutes - whilst maintaining the pressing pressure, and can then be devested as usual.

The *for* 2 press System offers the following advantages

Low investment

- Low costs, profits

Known manufacturing process

- Rapid learning curve (return of investment)

Perfectly fitting prosthetics

- Quality, patient satisfaction

Controllable investment material

- Controllable friction properties

Extensive area of indication

- Large scope

Can be veneered with visio.lign

- Aesthetic result

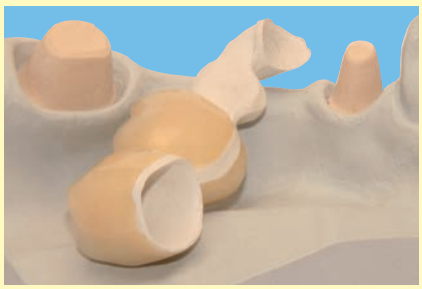
Coordinated overall system

- Process reliability when handling

Indications of BioHPP

Fixed dental prosthesis

Posterior area



4-part posterior bridge veneered with visio.lign. Due to the high level of fracture resistance, up to two pontics are possible. Due to the white shade effect of the material, an optimum veneer basis is provided.

Anterior area

Photos: Schwindt Dental Laboratory, Landau/Pfalz.

The aesthetic zone in the anterior area offers the best possible range of indications for this biocompatible and metal-free framework material.

Removable dental prosthesis

Bridgework

The **BioHPP** offers outstanding friction properties in combination with metallic and ceramic primary structures. As far as the patient is concerned, the high wearing comfort and ease of insertion and removal stand to the fore. The inert properties preclude any interactions with other materials.

Telescopic work

Photo: Annett Fiedler, Dental Laboratory, Neulußheim

There is no loss of friction thanks to the flexibility of the material and the ease with which the secondary structure can be veneered.

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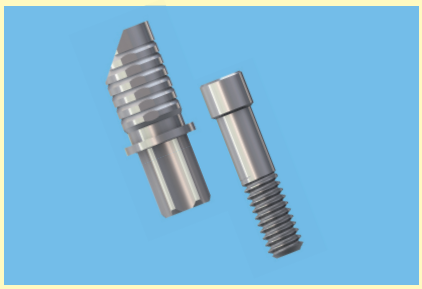
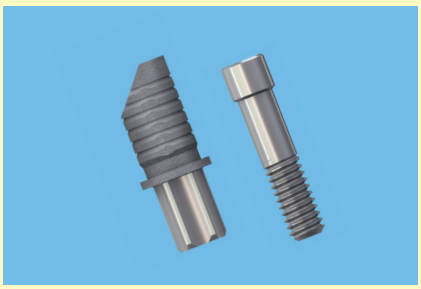
Implantology

SKYelegance – individual abutments



The individual abutment "SKYelegance" has been developed for bredent medical's SKY and blueSKY implants. In the future, additional abutments will also be available for other companies' implant systems.



The SKYelegance is blasted with aluminium dioxide with a grain of 110 µm and a max. pressure of 3 bar before wax modelling.

Finished wax modelling on the SKYelegance.

The wax model is sprued with the SKYelegance on the base mould of the *for* 2 press system. A casting bulb is used for this.

The SKYelegance individual abutment is over-pressed with BioHPP.

The finished abutment can now be directly veneered or treated with a ceramic crown.

Example of application using a telescopic implant bridge

The titanium abutments SKYelegance that can be over-pressed are modelled with modelling wax and the parallel telescope surfaces are processed on the milling machine. Afterwards, the wax casting bulbs are added on the individual abutments.

The finished modelled abutments are fixed to the base mould. The mould is then invested with the brevest *for* 2 press investment material, pre-heated accordingly in the pre-heating oven and over-pressed with **BioHPP** in the *for* 2 press vacuum press device.

Taking into consideration the direction of insertion, the parallel surfaces of the primary parts made from **BioHPP** are milled and polished to a high shine.

After the production and polishing of the primary telescope, the entire wax model of the telescopic bridge can be modelled.

Due to the expansion of the investment material covering the material, optimum and durable friction properties are achieved.

The finished telescopic bridge is veneered with visio.lign veneers.

Example of use of SKY elegance abutment

Initial situation

Loss of the upper incisor. A bredent medical blueSKY implant was inserted in this patient. After a 3-month recovery period, the implant can be released and permanently restored.

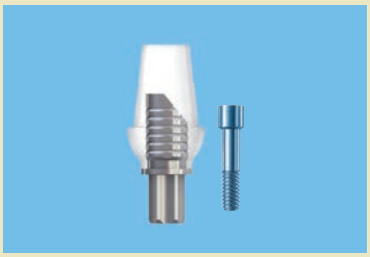
Perfect aesthetic result and a happy patient. The crown inserted has a natural translucency.

Photos: Dr. Alexandros Manolakis, Thessaloniki/Greece

The innovative BioHPP material was chosen as a framework material for the crown abutment. Due to the white shade effect, BioHPP is optimally suited for an aesthetic veneer with the bredent visio.lign system.

The elegance abutment is suitable for:

	Manufacturer	Implant
1	bredent medical	SKY®
2	Straumann®	Bone Level®
3	Nobel Biocare®	Nobel Active®
4	Astra-Tech®	Osseo Speed TX®



Disclaimer:
The terms "Straumann" and "Bone Level" used in this catalogue are brands of Straumann Holding AG, Switzerland/ he Straumann Group. The terms "Astra Tech" and "Osseo Speed" used repeatedly in this catalogue are brands of Astra Tech Aktiebolag, Sweden/the Dentsply Group. The terms "Nobel Biocare" and "Nobel Active" repeatedly used in this catalogue are brands of Nobel Biocare AB, Sweden/the Nobel Biocare Group.

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Processing steps

Initial situation

In order to provide optimum support to the framework structure, a casement or level preparation is required. We do not recommend any tangential preparations.

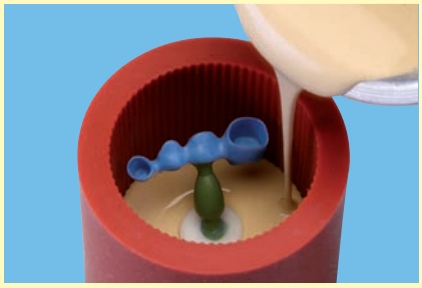
Modelling

The objects are modelled in accordance with the standard dental technical rules. In order to guarantee a mechanical bond between **BioHPP** and veneer composites, retention crystals can be used.

Sprue technology

In order to be able to achieve perfect pressing results, certain regularities such as selection of the supply channel, cross-care and positioning must be observed.

Investment



The wax model is invested with a special phosphate-bound investment material - taking into consideration the fluid concentration.

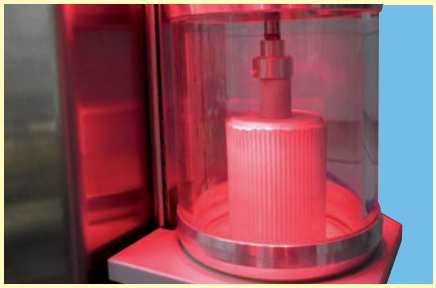
Pre-heating

The pre-heating process, for melting the wax and controlling expansion of the investment material, is carried out in the laboratory's own pre-heating oven (between 630°C and 850°C).

Melting

The melting procedure is carried out in the pre-heating oven. For this, the melting temperature of 400°C (20 min. and not longer) must be observed exactly and controlled.

Pressing



The pressing procedure in the *for* 2 press system is completed fully automatically within 35 minutes.

The dental technician is informed of the end of the automatic pressing procedure by an acoustic signal and by the blue LED light. The technician can then continue the process by immediately devesting the mould.

What makes the for 2 press system special is the fact that the pressing procedure is also continued when cooling the mould. This principle ensures the high material properties of the BioHPP, which are transferred into later treatment.

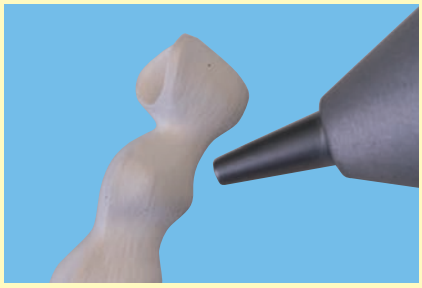
Devesting

The object transferred in **BioHPP** can be devested after 35 minutes. A short water bath guarantees freedom from dust and makes the devesting process easier. The fine investment material residues are removed using a fine blasting device with aluminium oxide with 110 µm max. 3 bar.

Adjustment

The simplicity of the adjustment is due to the material and reduces the need for time-consuming reworking. Fine cross-toothed carbide mills are particularly well suited to this.

Conditioning



The bridge framework is blasted with 110 µm and 2-3 bar pressure. The blasting distance must not be less than 3 cm.

In order to achieve a sufficient adhesion between veneer composites and framework material, a special adhesive (visio.link) must be used.

Veneering

Framework structures made from **BioHPP** can be veneered with all traditional veneer composites. The best results are achieved with visio.lign.

Polishing

The veneer composite and the **BioHPP** can be polished to a high shine, by following the correct polishing sequence.

High-shine polishing

Due to perfect high-shine polishing (five steps), the material properties of **BioHPP** with regard to plaque affinity, tendency to discolouration and surface quality are supported.
1. Step: Carbide mills
2. Step: Diagen-Turbo-Grinder
3. Step: Ceragum rubber polisher
4: Step: Bims goat hair brush
5. Step: Goat hair brush + Abraso Starglanz

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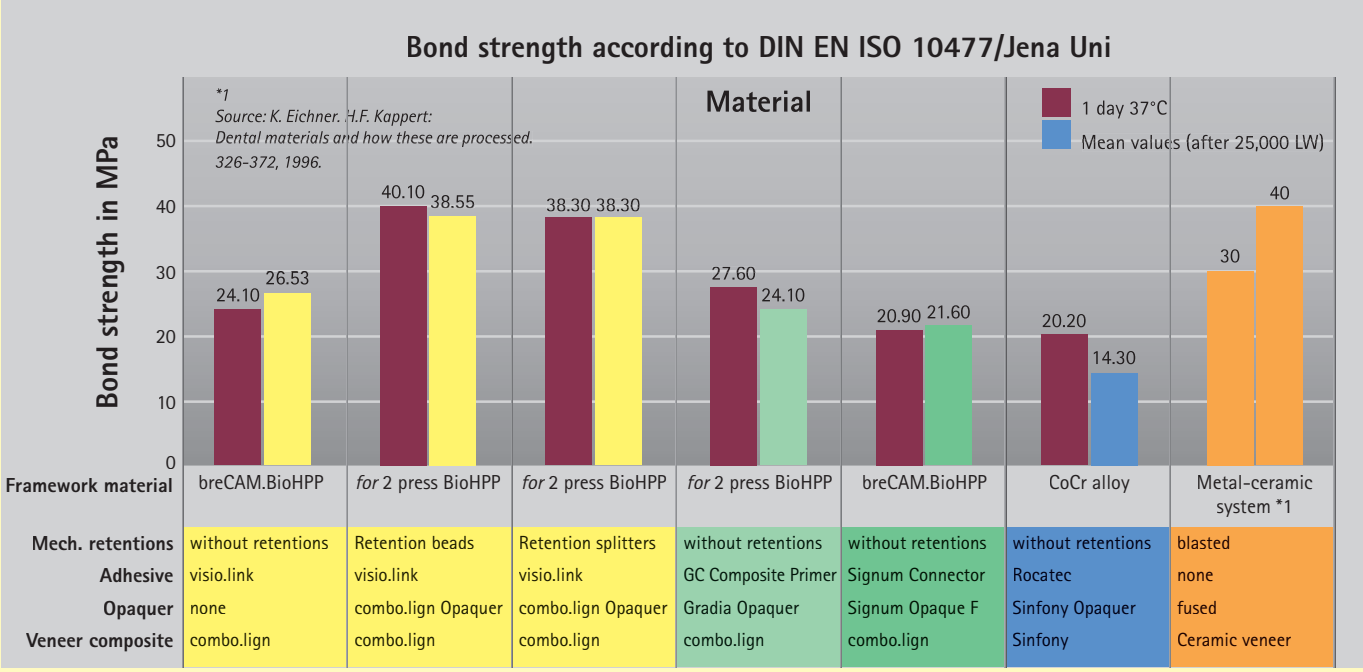
Bound by the BioHPP

Bond with visio.link from the visio.lign veneer system

To enable the manufacture of an aesthetically-pleasing and durable prosthetic with BioHPP, the bond between BioHPP and the composite veneer is of the utmost importance.

The visio.link adhesive from the visio.lign veneer system combines all the outstanding adhesive properties with materials such as PMMA and composites. In this way, visio.link is a primer and bonder in one.



The bond strength of different veneer composite systems was compared with the framework materials BioHPP and CoCr sample frameworks.
The highest bond strength values according to DIN EN ISO 10477 were achieved when using the visio.lign veneer system. A crucial factor for these high values is the use of mechanical retentions in the form of retention beads or splitters and the thin application of the special adhesive bredent visio.link.
If adhesives from other systems, such as Gradia by GC or Signum by Heraeus-Kulzer are used, bond strength values of 24.1 Mpa and 21.6 Mpa are achieved.
Therefore the use of visio.link as an adhesive yields higher values. Additional mechanical retentions should be applied for safety reasons.
As a result, significantly higher bond strengths are achieved on **BioHPP** frameworks than in traditional CoCr alloys.

Fixing restorations BioHPP orally

Restorations made from **BioHPP** must be fixed with adhesive, i.e. with composite adhesive such as Vario-Link (Ivoclar-Vivadent) or Panavia (Kuraray). The adhesive surfaces of the restoration made from **BioHPP** must be conditioned as follows for this purpose:

Blast the restoration made from **BioHPP** with aluminium oxide (110 µm) at 2 to 3 bar blasting pressure. Moistening then takes place with light-hardened PMMA & Composite Primer "visio.link" and subsequent polymerisation within a light polymerisation device (e.g. 90 seconds in a bre.lux Power Unit or Heraeus Kulzer UniXS) in accordance with the "visio.link" processing instructions.

Pre-treatment of the cavity by the dentist is carried out in the same way as with a ceramic or composite restoration.

This diagram shows how unfavourable the model of the pre-test bridge is with regard to a much too thin/unanatomical framework in combination with an unfavourable veneer layer that is much too thick.

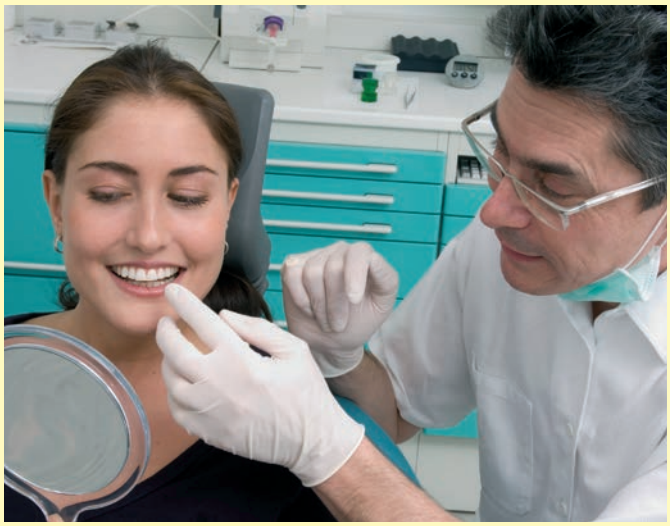
Advantages for the laboratory, the practice and the patient

Laboratory

- Extensive range of indications
- Biocompatible and metal-free
- High accuracy of fit
- Clear investment volumes
- Known processing procedures
- Ability to carry out veneers
- Effortless processing

Dentist

- Extensive range of indications
- Biocompatible and metal-free
- Veneers can be repaired intra-orally
- Appealing to patients
- White shade effect



Patient

- Higher level of wearing comfort
- Biocompatible and metal-free
- Plaque-resistant and colour-safe
- Aesthetic material
- Abrasion-resistant
- Protection of antagonists

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The system components

The material BioHPP

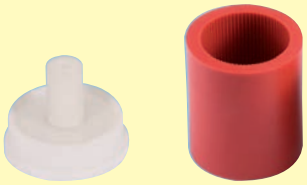
BioHPP is protected against moisture and packaged in transparent plastic tubes. The required quantity can be weighed out to the nearest gram using the wax calculation table. Only the material that is required is processed.

BioHPP (Granulate)
20 g REF 540F2PB2
100 g REF 540F2PB3

BioHPP (Pellet)
75 g (5 x 15 g) REF 540F2PB4
150 g (10 x 15 g) REF 540F2PB5

Mould system for the *for* 2 press mould

Consisting of one mould plate and the corresponding silicone ring. Available in 3 different sizes: 3, 9 and 9 XXL.



Mould plate and silicone ring

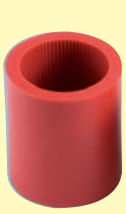
Size 3
REF 360F2P16

Size 9
REF 360F2P20

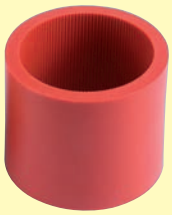
Size 9 XXL
REF 360F2P30

Silicone rings

Silicone ring suited for the mould system *for* 2 press mould. Quick and easy deforming of the bound investment material mould. Grooved inside, enlarged surface for rapid moisture emission during preheating.



Silicone ring
Size 3
REF 360F2PR3



Silicone ring
Size 9
REF 360F2PR9

Mould plate

Mould plate (individual)
Size 3
REF 360F2PT1

Mould plate (individual)
Size 9
REF 360F2PT2

Mould plate (individual)
Size 9 XXL
REF 360F2PT3

Disposable press plunger *for* 2 press filler

Disposable press plunger for pressing the high-performance plastic in. Rounded on one side for a better glide during the pressing procedure. Uniform cooling concomitantly to investment material, no risk of the press material cracking, pressed in firmly. Can be used once.

***for* 2 press filler (disposable press plunger)**
16 mm 25 pc.
suitable for mould plate size 3
REF 570F2P16

***for* 2 press (disposable press plunger)**
20 mm 25 pc.
suitable for mould plate size 9
REF 570F2P20

***for* 2 press (disposable press plunger)**
30 mm 14 pc.
suitable for mould plate size 9 XXL
REF 570F2P30

Brevest investment material *for* 2 press

Fine grain special investment material for the *for* 2 press System. Suited for use as a speed investment material or conventionally heated up. Easy to remove.

Brevest *for* 2 Press
carton with approx. 7.35 kg
incl. 1000 ml Bresol *for* 2 press
REF 570F2PV1

Fluid for the investment material brevest *for* 2 press

Bresol *for* 2 press
1000 ml
REF 520F2PL1

for 2 press Basic Set

This set contains basic equipment for immediate work. Based on the size of the model, the *for* 2 press Basic Set is sufficient for5 – 7 presses and contains all of the necessary materials.

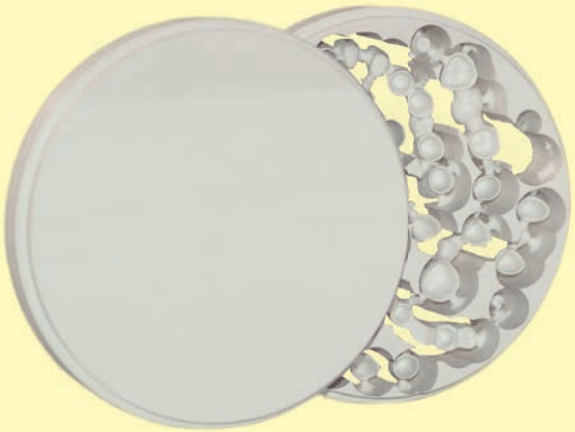
Contents

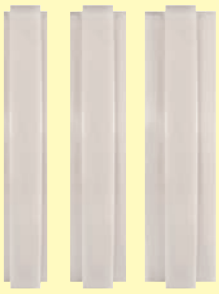
1 x *for* 2 press pneumatic vacuum press device
1 x *for* 2 press mould (mould system, consisting of mould plate size 3/16 mm and silicone ring)
35 x 210 g Brevest *for* 2 press investment material incl. 1000 ml Bresol *for* 2 press liquid
25 x *for* 2 press filler (disposable press plunger size 16 mm for pressing the material into the mould)
20 g **BioHPP**, thermoplastic high-performance plastic

***for* 2 press Basic Set**
REF 14000601

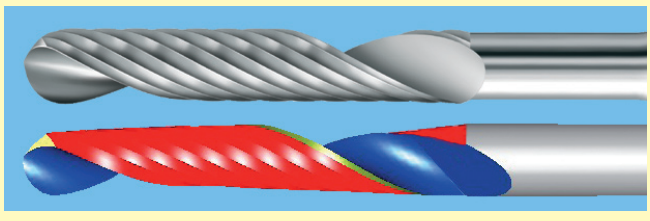
BioHPP – granulate or blanks?

BioHPP is available as a milling round blank breCAM.**BioHPP** for processing in CAD/CAM manufacturing. The milling round blanks are processable in every standardised milling machine when using a breCAM.Cutter (mill) especially developed for this purpose. The material properties between pressed and milled **BioHPP** are virtually identical. The milling round blanks are produced without material degradation due to the especially developed manufacturing procedures.





breCAM.cutter with patented cutting geometry



Order information	16 mm REF	20 mm REF	24 mm REF
breCAM.BioHPP	540 0203 0	540 0203 1	540 0203 2

Further information can be found in Brochure REF 000470GB.

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