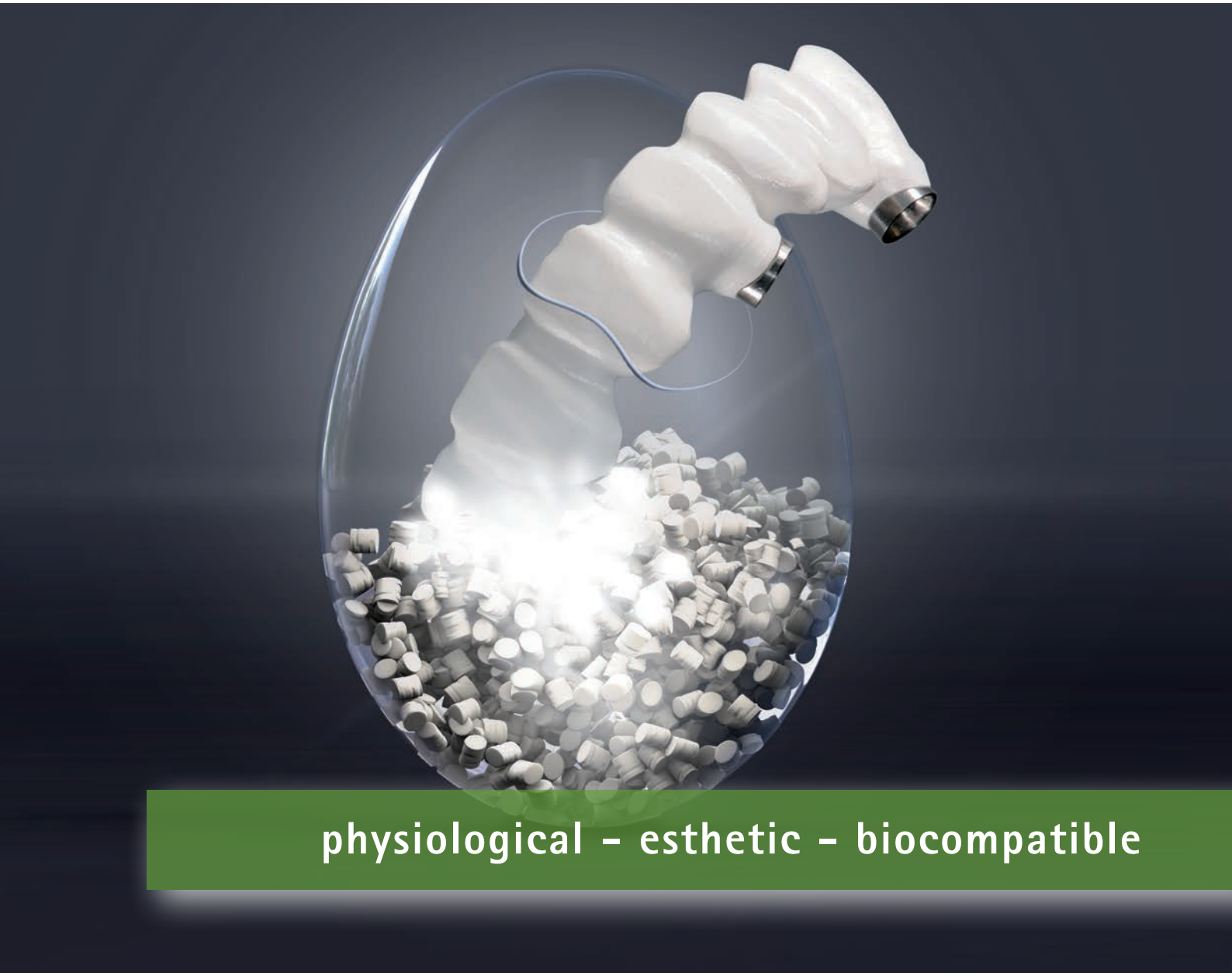
BioHPP®

The reference for physiological substructure materials



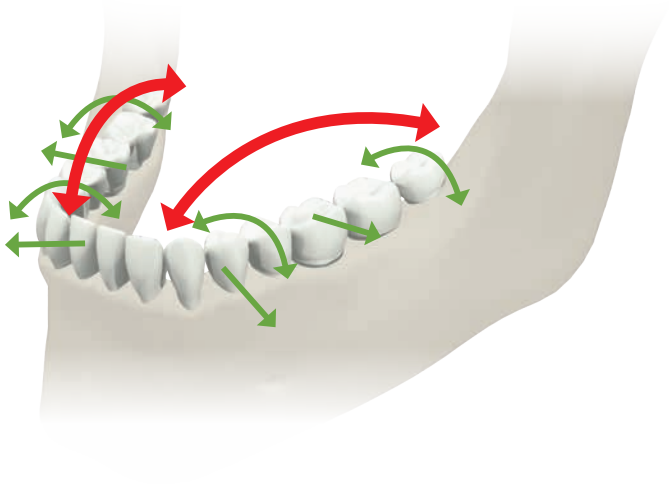
physiological – esthetic – biocompatible

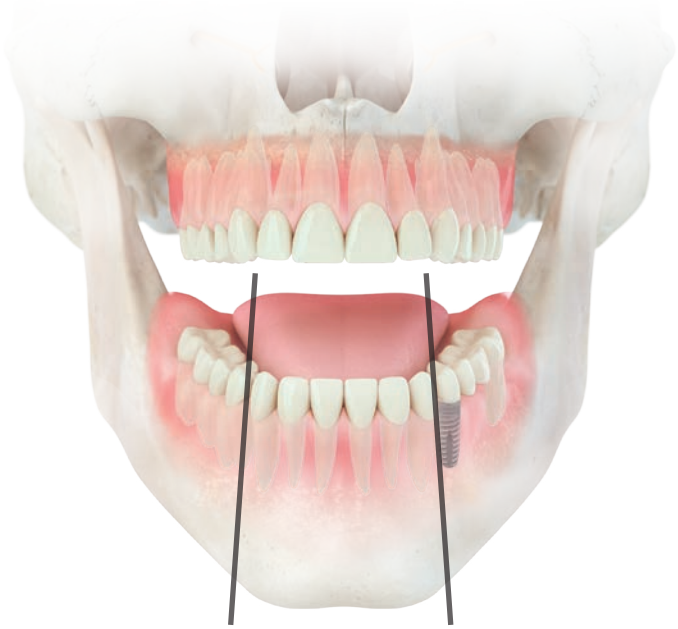
bredent group

The physiological solution

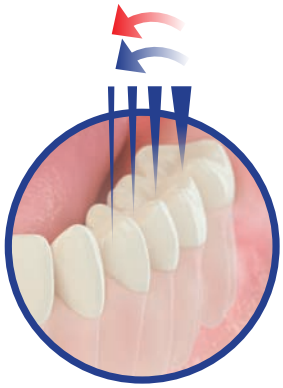
Transfer of forces to the jawbone

Extremely rigid prosthetic materials withstand natural torsion of the jawbone. If they are connected to a rigid bridge structure (metal, zirconium, etc.) in the area of the premolars and molars, the tensile and compressive forces are increased in the area of the roots. Natural teeth are able to partly compensate for these forces but fixed osseointegrated implants do not provide this compensating effect. These forces act on implants and the bone at an unfavorable angle and, in the macro area, they also affect the physiological movement pattern and have negative effects on the dorsocranial movement capacity, CMD, ossoeintegration or bone atrophy.

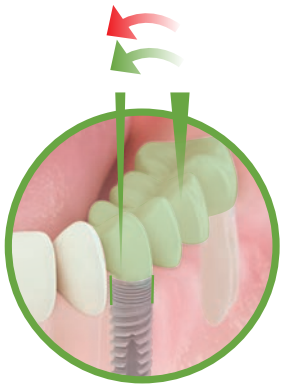




Compared to titanium, zirconium or ceramic, rehabilitation with BioHPP significantly reduces peak masticatory forces both for vertical and lateral movement. This property produces a positive effect for the patient and increases the durability of the restoration.

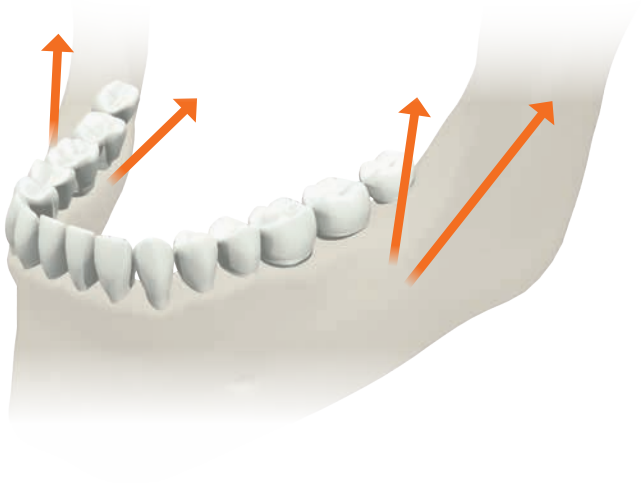


Natural tooth



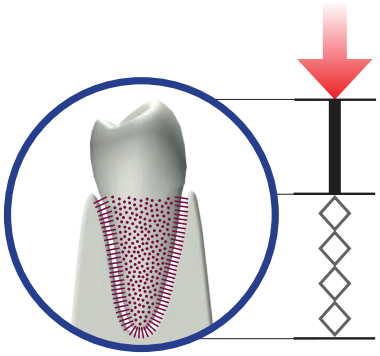
Rehabilitation with BioHPP reduces the stress caused by natural forces and the forces attributed to the prosthetic restoration.

Rigid materials prevent natural movement and transfer forces to the implants and the jawbones.

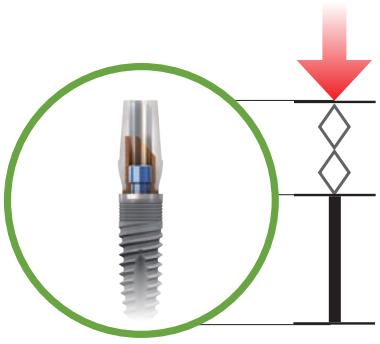


Transfer of peak masticatory forces to the jawbone

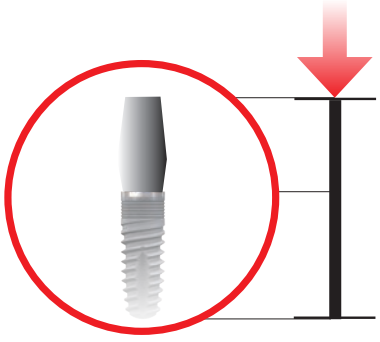
The Sharpey's fibers support retention of the tooth within the jaw and also absorb forces applied to the tooth. This property is no longer available after placement of an implant or for a root-treated tooth, so that peak masticatory forces are transferred directly and entirely into the jaw. From a mechanical point of view, this affects osseointegration and produces adverse effects for opposing teeth. These peak forces can be considerably reduced with abutments made of BioHPP. This is particularly important for cases of immediate restoration to ensure reliable osseointegration.



The Sharpey's fibers reduce peak masticatory forces.



To some extent, BioHPP adopts the effect of the missing Sharpey's fibers.



No damping.
A restoration made of rigid materials (titanium or zirconium) provides 1:1 transfer of forces to the implant and the jawbone.

Stages of success

- **Use of PEEK high-performance polymer in human medicine over more than 35 years**
- **More than 10 years of experience in the field of prosthetic rehabilitation**
- **More than 3,500 patients with BioHPP restorations**
- **More than 1,800 dental laboratories use BioHPP**
- **Documented by more than 30 university and clinical studies**

See selection of studies 1-19
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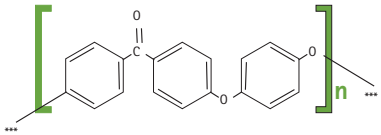


1980 1985 1990 1995 2000 2005

1980 PEEK is an established denture resin in human orthopedic surgery due to its physiological properties and stability.

1988 the PEEK material is approved for oral use in dentistry.

2004 bredent is the first company worldwide to successfully launch a PEEK-based substructure material in the dental sector. This material is called BioXS and is still preferably used in the flasking technique.

2007 bredent presents the visio.lign product line that completes the system of physiological substructure materials with esthetic materials for permanent implant prosthetics (veneers, teeth and composite) and as an alternative to ceramics.

2008 visio.link is the first and so far the only bonding agent to produce bond strength values between the visio.lign veneering products and substructure materials, such as BioHPP, that could not be achieved with any other materials and bonding agent.

2011 After completion of an international development phase, BioHPP is approved for use as universal, tooth-colored substructure material for fixed, removable, implant-supported and permanent dental restorations.

2014 The use of breCAM.BioHPP and breCAM.HIPC allows to combine the digital and analog advantages. With the 2 in 1 concept, a 24-hour overnight service can be offered to fabricate a tooth-colored substructure and a veneer with a natural appearance in a single workflow.

2010

2015

2013 BioHPP elegance enables bredent to offer the first individual hybrid abutment (no adhesive gap) as a physiological and technically perfected alternative to titanium abutments for more than 9 implant systems now.

2016 BioHPP elegance prefab is presented on the market to enable the fabrication of individual, physiological hybrid abutments (no adhesive gap) in a digital process in less than 15 minutes.

Indications

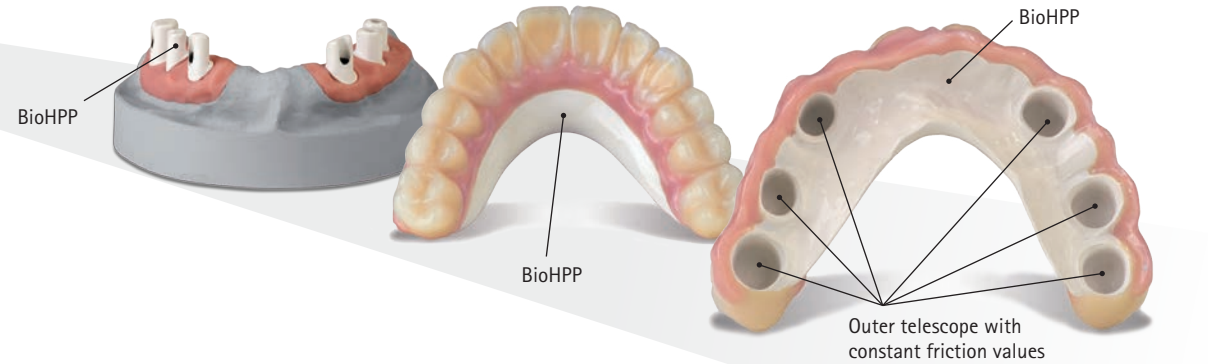
BioHPP was continuously advanced so that specific materials are available for a wide range of indications. Some examples:

Fixed restorations

- Single crowns
- Bridges (max. two pontics)
- Adhesive bridges (Maryland)

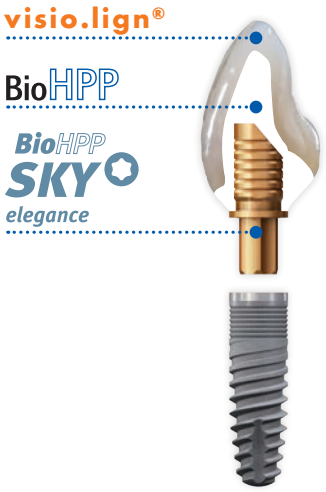
Removable restorations

- Superstructures with or without friction elements
- Secondary parts for the telescopic crown technique and bar superstructures
- Primary crowns



Implant prosthetics

- Individual abutments for 9 different implant systems (BioHPP elegance)
- Crowns and bridges (screw-retained or cemented)
- Crown and bridge substructures
- Removable superstructures
- Crown abutments
- Primary parts
- Toronto Bridge



Photos: Sebastian Schuldes (MDT), Eisenach, Germany

What is BioHPP?

Biocompatible High Performance Polymer

From PEEK to BioHPP

PEEK has been used as an implant material in human medicine (finger prostheses, intervertebral discs and hip joint prostheses) for 35 years. The benefits can be attributed to the highly compatible material properties which make fusion with the bone possible. Moreover, the mechanical material properties are very similar to that of bone material.

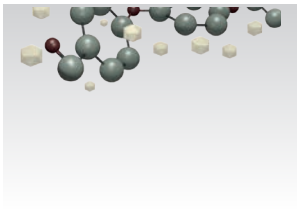
The mechanical values of pure PEEK, however, are not sufficient for the use in more comprehensive indications and the more stringent requirements for use in the oral cavity. The base material had to be refined.

BioHPP is a partially crystalline, thermoplastic high-performance polymer based on PEEK (polyether ether ketone) filled with inorganic microparticles with a diameter of less than 0.5 µm. Physiological elasticity was retained and the combination of perfect rigidity and exceptional polishing characteristics could be achieved.

As a result, BioHPP is the only material to achieve perfect balance between:

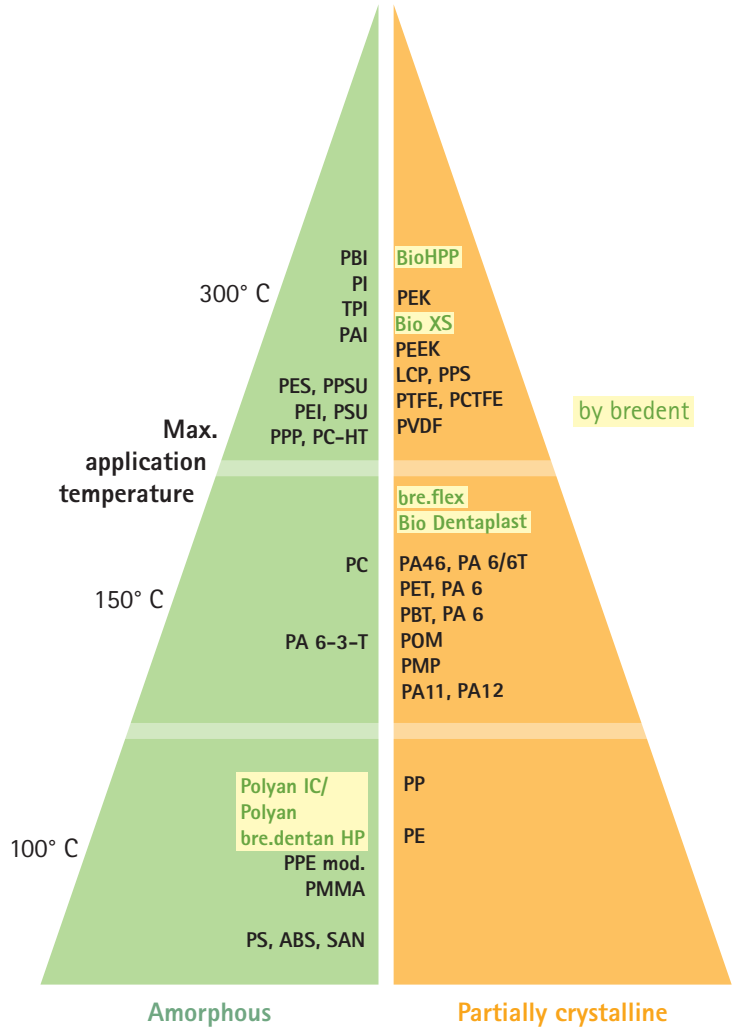
- ✔ Elasticity and rigidity
- ✔ Weight and fracture strength
- ✔ Physiology und resistance to plaque

BioHPP is the strongest non-metallic material in dentistry



Structural formula of a PEEK molecule. The white cloud is an indicator of the ceramic filler which accounts for excellent mechanical material properties, especially for the use in dental techniques.

Competence in the field of resins



Distinctive features of BioHPP

Material	BioHPP	Nature (Reference)	Pure PEEK	PMMA	PM alloy	Titanium	Zirconium
Specific weight	1.4 g/cm³		1.3 g/cm³	1.18 g/cm³	19.3 g/cm³	4.5 g/cm³	6.5 g/cm³
Hardness	30 HV = 294 N/mm²		20 HV	18 HV	190 – 240 HV	300 – 400 HV	1.200 HV
Modulus of elasticity	4.200 – 4.800 MPa*	Jaw bone 2.000 – 12.000 MPa	3,600 MPa	3,600 MPa	60,000 – 130,000 MPa too hard	115,000 MPa too hard	205,000 MPa too hard
Water absorption of composites	6.5 µg/mm³		5 µg/mm³	19 µg/mm³			
Water solubility	< 0.03 µg/mm³		0.05 mg/mm³	1-1.4 mg/mm³	insoluble	insoluble	insoluble
Flexural strength	180 - 185 MPa		165 – 170 MPa	95 – 105 MPa			100 – 180 MPa
Bond strength (with veneering material)	> 38,8 MPa [1)]		20 MPa (composite)		20 – 30 MPa (with ceramic)	> 25 MPa	> 25 MPa
Thermal conductivity	low	low	low	low	high	high	low
Surface polishing characteristics	< 0,02 µm very good		poor	< 0.05 µm good	good	poor	good

* Depending on the type of processing, pressing / milling
[1)] When using visio.link and combo.lign opaquer

Safe

BioHPP features exclusively material properties that are identical to those of previously established materials. The use of BioHPP does not include any risks or hazards. BioHPP exhibits better values in a lot of disciplines and hence is the material of choice for the majority of indications.

Physiological

- resilient
- shock-absorbing
- non-abrasive for the residual teeth
- elastic like jaw bone
- resistant to fracture & torsion
- tolerant
- friction values are retained

Biocompatible

- metal-free
- hypoallergenic
- insoluble in water
- resistant to plaque
- prevents electrolytic conduction
- keeps inherent strength in contrast to ceramic
- no age-related degeneration
- resistant to gamma and x-ray radiation
- chemically stable

Impresses patients

- ✔ natural esthetics
- ✔ natural chewing capability
- ✔ natural feeling in the mouth
- ✔ light material
- ✔ more pleasant than rigid restorations
- ✔ optimized price-performance ratio
- ✔ does not stain

Benefits for processing

- ✔ desired shape can be achieved with limited effort (pressing, CAD/CAM, finished parts)
- ✔ easy to grind (mill), also in situ
- ✔ easy to polish
- ✔ easy to veneer

What does BioHPP offer?

Mechanical benefits

The perfect combination of elasticity and rigidity

- **Shock-absorbing** - as an abutment it supports osseo-integration of implants, is suitable for immediate restorations
- **Torsionally flexible** like healthy bone, allows natural, physiological torsion of jaw braces
- **Resistant to fracture** - studies document the suitability of BioHPP for the fabrication of large-sized bridge structures with spans of up to 16 mm [a)b)]
- **Perfectly suitable for veneering –** BioHPP and visio.lign produce bond strength values that exceed the highest values of ceramic materials [c)]
- **Easy to process** - BioHPP can even be ground and polished in the oral cavity without the risk of reducing the quality of the material structure.

Prosthetic stability for permanent restorations – even for implant prosthetics

Thanks to the bound microceramic fillers, BioHPP is easier to veneer, more rigid and stable, more resistant to fracture and features better polishing properties and machinability (CAD/CAM) than pure PEEK. Moreover, BioHPP also allows the fabrication of physiological restorations [d)].

Test setup with standardized samples from the University of Regensburg [e)]

Studies

a) cf. study 4 University of Munich
b) cf. study 5 University of Munich
c) cf. study 8 University of Regensburg
d) cf. study 2 University of Jena
e) cf. study 17 University of Regensburg

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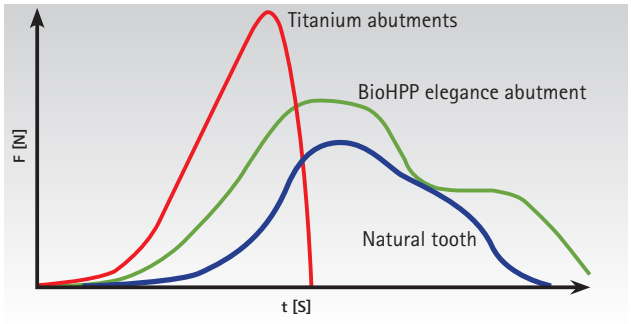
Transfer of peak masticatory forces to the jaw bone



BioHPP compensates the lack of natural shock absorption by the Sharpey's fibers. The elasticity of BioHPP reduces the peak masticatory forces and directs the forces to the bone via the implant over an extended period. As a result, immediate rehabilitation with implants and optimized os-seointegration are enabled.

Physiological elasticity

The modulus of elasticity of BioHPP that corresponds to the average value of the jaw bone differs by a factor of 27 from the value of rigid substructure materials, such as titanium and ZrO_2, which are still frequently used.

E-modulus	Factor			
Jawbone	BioHPP	Gold	Titanium	Zirconium
1,000 – 12,000 = 4,200 – 4,800 MPa	=	x 20	x 25	x 27

Fault-tolerant, versatile processing

Restorations made of BioHPP - large-span bridges or single, individual abutments - can be fabricated in the thermo-plastic pressing technique or in a CAM process. Reworking using grinding and polishing processes can be easily and quickly completed and does not compromise the material quality unlike for ZrO_2. It can and should be carried out in the oral cavity.

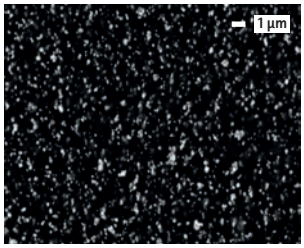
Biological benefits

Superior physiology from the biological view

- **Biocompatible – Bi**oHPP is a class 2a medical device and complies with all relevant DIN standards, is not cytotoxic and hence biocompatible (DIN 10993-05,10, 11, 03, 12)
- **Metal-free**, no ion exchange, not allergies, no metal taste [d)]
- **Plaque-neutral 1,** the official polishing protocol for BioHPP shows a surface smoothness which partly exceeds the one of a successful veneer[d)] This can be attributed to the small particle size of < 5µm of the bound inorganic microparticles
- **Plaque-neutral 2,** the low water absorption of 6.5 µg/mm³ avoids plaque accumulation and hence odor generation and discoloration
- **Kind to the gingiva –** soft tissue management is considerably facilitated by the high level of acceptance and integration of BioHPP in particular since individual BioHPP abutments are suitable one-time abutments in immediate restorations[g)]

Ease of polishing and cleaning

BioHPP can also be easily cleaned by the patient using a soft toothbrush without roughening the surface. Professional and chairside tooth cleaning can be conveniently performed with a soft abrasive agent and subsequent polishing is carried out with standard tools. Surface roughness of 0.05 µm is achieved to protect against discoloration and plaque accumulation. In the direct comparison, BioHPP provides better polishing properties than successful dentures and veneering composites.[h)]



Homogeneous and fine-grained surface of BioHPP at a magnification of 1000x under the electron microscope.

Studies

f) cf. study 17 University Clinic of Tübingen
g) cf. Scientific & Clinical Cases: „Physiologische Prothetik"
h) cf. study 7 University Clinic of Cologne

... on page 13

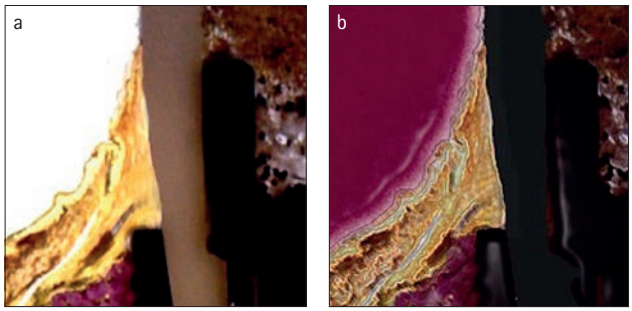
Kind to the gingiva

Apparent after removal of the gingiva former: a bleeding margin indicates significantly improved gingival attachment compared to the titanium abutment.

Photos from the Department for Implantology of the Dental Clinic IRCCS Fondazione Policlinico Ospedale Maggiore Università degli Studi di Milano (Scientific & Clinical Cases: „Physiologische Prothetik", see page 16).

Immediate restorations – clinical advantages of BioHPP (SKY) elegance

Conclusion
The analysis of the clinical cases and animal experiments document that - in cases of immediate loading - the new individual abutment BioHPP SKY elegance is a reliable alternative to industrial titanium abutments. Moreover improved healing of the soft tissue is achieved.



Histological analysis of the SKY elegance abutments. Details on the platform switch and the gingival attachment:
a) After 4 weeks
b) After 8 weeks
Prof. Dr. José Eduardo Maté Sanchez de Val, PhD, MSc, DDS, Murcia, Spain; this study will be published .

What does BioHPP offer?

Prosthetic benefits

Outstanding quality of the restoration

- Stability - thanks to the very high mechanical strength values, BioHPP is suitable for very large bridge substructures (spans of up to 16 mm) and for removable restorations in implant prosthetics [a)]
- Resistant to abrasion - telescopic restorations made of BioHPP demonstrate exceptional durability of the friction function [b)]
- Can be perfectly veneered - BioHPP in combination with the visio.lign system produces higher bond strength values than restorations made of NPM (veneered with ceramics) and ZrO_2 [a)]
- Light - patient acceptance is increased thanks to the light weight of the restoration; BioHPP substructures are 4 times lighter than ZrO_2 substructures
- Tooth-colored - exposed areas made of BioHPP (available in white and tooth-colored) can hardly be noticed, dark areas do not need to be compensated by the veneer
- Natural feeling in the mouth, weight, thermal conductivity, elasticity, smoothness and the physiological integration into the body system ensure that the patient forgets that he is wearing a denture

Studies

a) cf. study x University of Munich
b) cf. study 12 University Clinic of Cologne
c) cf. study 2 University of Jena

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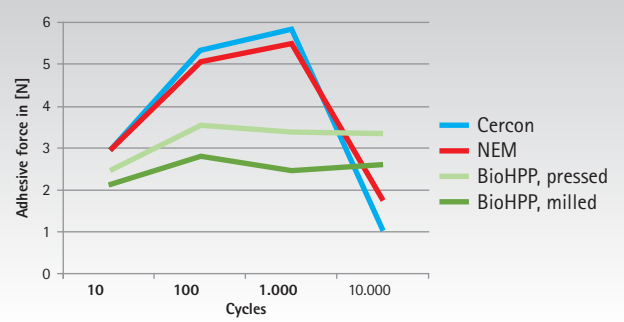
Wearing comfort

Patients who are able to make a comparison prefer restorations made of BioHPP (instead of ZrO_2, for example) because of the light weight of the denture and the natural feeling in the mouth.

Weight	Factor			
Jaw bone	BioHPP	Gold	Titanium	Zirconium
1.3 – 1.4 g/cm³	x 1	x 14	x 3	x 5

Reliable friction

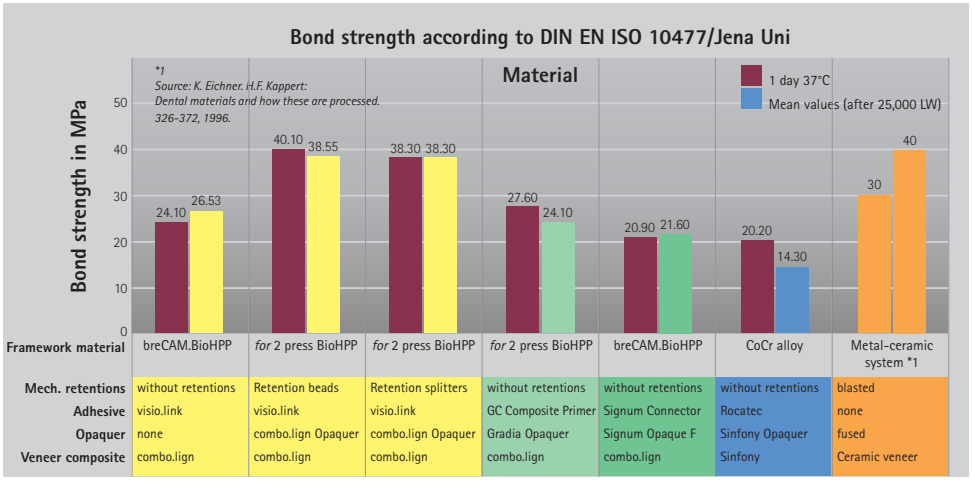
Compared to ZrO_2 and non-precious metal, BioHPP reveals superior consistency in wear tests. Based on the resistance to abrasion, the University Clinic of Cologne even recommends: „The use of BioHPP primary elements with BioHPP secondary elements should be preferred." [b)]



Result diagram of the University Clinic of Cologen [b)]

Reliable bonding to the veneer

Studies have shown that BioHPP in combination with the visio.lign system produces the highest bond strength values compared to silanized CoCr or metal veneered with ceramic. The advantage of the visio.lign system lies in the fact that it contributes to the physiological benefits of BioHPP. This combination ensures perfect, most efficient and economic restorations.



Selection of university studies on BioHPP

No.	Date	Titel	University	Authors
1	13.02.2012	In-vitro-Untersuchung viergliedriger Brücken auf Kunststoffstümpfen (TCML und Bruchtest): Vollanatomische Gestaltung aus PEEK gefräst bzw. gepresst	Universitätsklinikum Regensburg - Poliklinik für Zahnärztliche Prothetik	Priv.-Doz. Dr. Dipl.-Ing. (FH) Martin Rosentritt Prof. Dr. Carola Kolbeck
2	05.06.2012	Ergebnisse werkstoffkundlicher Untersuchungen des Brückengerüstwerkstoffes BioHPP	Universitätsklinikum Jena - Poliklinik für Zahnärztliche Prothetik und Werkstoffkunde	A. Rzanny, R. Göbel, M. Fachet
3	30.11.2012	Einsatz von PEEK-Classix als Basismaterial für die Herstellung CAD/CAM gefertigter Provisorien - eine werkstoffkundliche Studie	Charité Berlin - Medizinische Fakultät	Ralf Wagner
4	19.03.2013	Einfluss der Herstellung auf die Bruchlast von dreigliedrigen PEEK-Brücken	Ludwig-Maximillian Universität München - Poliklinik für Zahnärztliche Prothetik	Dipl. Ing. Bogna Stawarczyk, MSc. Marlis Eichberger, ZT
5	01.04.2013	Verbundfestigkeit zwischen PEEK-Kunststoffen und Verblendkunststoffen in Abhängigkeit von der Oberflächenvorbereitung im Scherversuch nach EN ISO 10477	Uniklinik Köln - Zentrum für Zahn-, Mund- und Kieferheilkunde	Elsbernd, Franziska
6	08.11.2013	In-vitro Untersuchung von dreigliedrigen standardisierten Brücken	Universitätsklinikum Regensburg - Poliklinik für Zahnärztliche Prothetik	Priv.-Doz. Dr. Dipl.-Ing. (FH) Martin Rosentritt Prof. Dr. Carola Kolbeck
7	20.01.2014	Effect of different chair-side surface treatment methods on dental restorative materials with respect to contact angles and surface roughness	Uniklinik Köln - Vorklinische Zahnheilkunde	Frau Candida Sturz
8	08.05.2014	Retentionskräfte von Teilprothesenklammern aus PEEK-basierten Kunststoffen	Ludwig-Maximillian Universität München - Poliklinik für Zahnärztliche Prothetik	Sebastian Bauer, Marlis Eichberger, Bogna Stawarczyk
9	11.06.2014	Übersicht zu Befestigung und Verblendung von PEEK-basierten Restaurationen		Bogna Stawarczyk, Nicoleta Ilie
10	23.06.2014	Biofilm formation on the surface of modern implant abutment materials.	Universitätsklinikum Regensburg - Poliklinik für Zahnärztliche Prothetik	Hahnel S, Wieser A, Lang R, Rosentritt M.
11	01.07.2014	Untersuchung der Oxidschicht und deren Entstehung (Vermeidung) bei vorgefertigten Titanabutments SKYelegance im Zusammenhang mit dem Überpressvorgang mit BioHPP	Hochschule Osnabrück University of Applied Sciences - Labor für Metallkunde und Werkstoffanalytik	Prof. Dr. I.-M. Zylla
12	01.07.2014	Versuch zur Überprüfung der Abzugskräfte zwischen Abutment (Titan, BioHPP) und Käppchen (ZrO_2, BioHPP) mit 4°/8° Konuswinkeln zur Verifizierung verschiedener Zemente	Universitätsklinikum Regensburg - Poliklinik für Zahnärztliche Prothetik	Priv.-Doz. Dr. Dipl.-Ing. (FH) Martin Rosentritt Prof. Dr. Carola Kolbeck
13	01.09.2014	In-vitro-Untersuchungen mit BioHPP in der Teleskoptechnik	Uniklinik Köln - Zentrum für Zahn-, Mund- und Kieferheilkunde	Frau Dr. Holzer
14	05.12.2014	Möglichkeiten und Grenzen von PEEK im dentalen Bereich	Universitätsklinikum Regensburg - Poliklinik für Zahnärztliche Prothetik	Priv.-Doz. Dr. Dipl.-Ing. (FH) Martin Rosentritt Prof. Dr. Carola Kolbeck
15	Jan 15	Einführung der Thermoplaste in die Zahnarzt-Praxis	Steinbeis Universität Berlin - Biomedical Interdisciplinary Dentistry	Ilija Pranjic
16	01.01.2015	In-vitro-Untersuchungen mit BioHPP in der Konuskronentechnik	Uniklinik Köln - Zentrum für Zahn-, Mund- und Kieferheilkunde	Nowak, Johanna; Holzer, Nadine
17	27.01.2015	In-vitro-Untersuchung viergliedriger Brücken auf Humanzähnen (TCML und Bruchtest): verschiedene Gerüst-/Verblendmorphologien	Universitätsklinikum Regensburg - Poliklinik für Zahnärztliche Prothetik	Priv.-Doz. Dr. Dipl.-Ing. (FH) Martin Rosentritt Prof. Dr. Carola Kolbeck
18	17.02.2015	Friktionsverlust von Teleskopen und Konuskronen	Ludwig-Maximillian Universität München - Poliklinik für Zahnärztliche Prothetik	Veronika Stock, Marlis Eichberger, Christina Wagner, Susanne Merk, Malgorzata Roos, Patrick R. Schmidlin, Bogna Stawarczyk
19	01.08.2015	1. In-vitro Untersuchung von Molarenkronen im Kausimulator (TCML) und deren Bruchfestigkeit nach Alterung. 2. Exkurs: Einfluss von Hybridabutments aus BioHPP auf die Festigkeit von den unter Teil 1 verwendeten Kronen (nur emax)	Universitätsklinikum Regensburg - Poliklinik für Zahnärztliche Prothetik	Priv.-Doz. Dr. Dipl.-Ing. (FH) Martin Rosentritt

Some clinical cases			
2014	Scientific Poster	SKY elegance Abutment - permanent restoration - conventional fabrication	Dr. Goldschmidt, Lingen, Germany Laboratory, MDT Martina Brüffer, Osnabrück, Germany
2014	Scientific Poster	Immediate restoration of a single tooth gap with CAD/CAM processes on SKY elegance abutments	Dr. Robert Schneider MSc MSc, Neuler, Germany
04.2015	BDIZ EDI konkret	Verwendung von Abutments auf Polymerbasis für definitive Versorgungen	José Eduardo Maté-Sánchez de Val and José Luis Calvo-Guirado
2015	ZAHNTECH MAG 19, 6	"Klassiker im neuen Gewand Zwei bewährte implantatprothetische Versorgungen metallfrei umgesetzt"	MDT Maxi Findeiß
2015	Quintessenz ZT 2015;41(6):2–16	Metallfreie Reproduktion (BioHPP) eines NEM-Gerüstes im manuellen Vorgehen	MDT Massimiliano Trombin

and numerous others; please request information!

How is BioHPP cleaned and polished?

By the patient

The patients should preferably clean his teeth every day using a soft to medium hard toothbrush. The use of rotary electric toothbrushes is recommended; ultrasonic toothbrushes, however, should not be used since they may have adverse effects on the surface.

In the dental practice

Professional tooth cleaning
Restorations made of BioHPP can be easily cleaned and subsequently polished in the dental practice using standard instruments and materials for soft high performance polymers. For more and detailed information, the „BioHPP Praxis Guide" is available.

Sterilization
The individual and adhesive gap-free elegance abutments can be sterilized using steam sterilization (autoclave) in the vacuum procedure. For this purpose 3-times fractionated prevacuum must be generated with a sterilization time of 4 minutes and a temperature of 134°C +/- 1 °C.

Dental hygienist Ms Vesna Braun

How is BioHPP bonded?

Type of bonding	BioHPP® crowns and bridges to...	Bonding systems				
		Metal/alloy abutments	Zirconium dioxide abutments	BioHPP® abutments	Hard tooth substance (dentine/enamel)	Use visio.link on BioHPP®
permanent	Adhesive – with conditioning/primer using composite cement, e.g. Panavia F 2.0 (Kuraray), VarioLink II (Ivoclar), NX-3 (Kerr)	✓	✓	✓	✓	✓
	Self-adhesive composite cement 110 µm (sandblasting), e.g. Rely X Unicem (3M Espe)	✓	✓	✓	●	●
	Glass ionomer cement, e.g. Ketac Cem (3M Espe)	●*	●*	●	●*	X
	Zinc phosphate cement (e.g. Harvard)	●	●	●	●*	X
temporary	Zinc oxide, eugenol-free cement (Tempbond by Kerr)	✓	✓	✓	●*	X
	A-Silicone-based fixing cement (Temposil 2 by Coltène Whaledent)	✓	✓	✓	✓	X

* Use only for preparation angles up to 5°

Type of bonding	BioHPP abutment with framework materials made from...	Bonding systems				
		use visio.link on BioHPP®	Dental alloys	Zirconium dioxide	BioHPP®	e.max (lithium disilicate/lithium silicate) silanized
permanent	Adhesive – with conditioning/primer using composite fixing cement, e.g. Panavia F 2.0 (Kuraray), VarioLink II (Ivoclar), NX-3 (Kerr)	✓	✓	✓	✓	K
	Self-adhesive composite cement 110 µm (sandblasting), e.g. Rely X Unicem (3M Espe)	●	✓	✓	✓	X
	Glass ionomer cement, e.g. Ketac Cem (3M Espe)	X	●*	●*	●	X
	Zinc phosphate cement (e.g. Harvard)	X	●	●	●	X
temporary	Zinc oxide, eugenol-free cement (Tempbond by Kerr)	X	✓*	✓*	●	X
	A-Silicone-based temporary cement (Temposil 2 by Coltène Whaledent)	X	✓	✓	✓	X

* Use only for preparation angles up to 5°

✓ = optimum K = only to be used for crowns ● = generally possible X = not recommended

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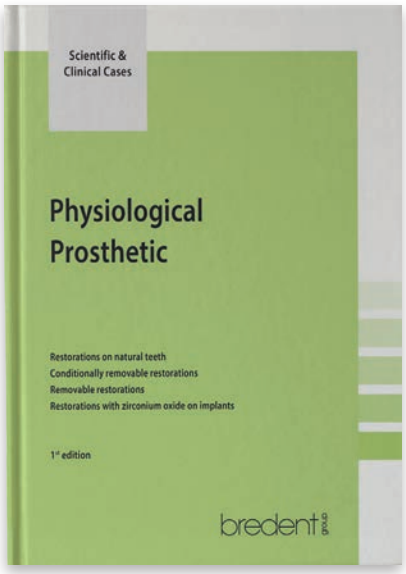

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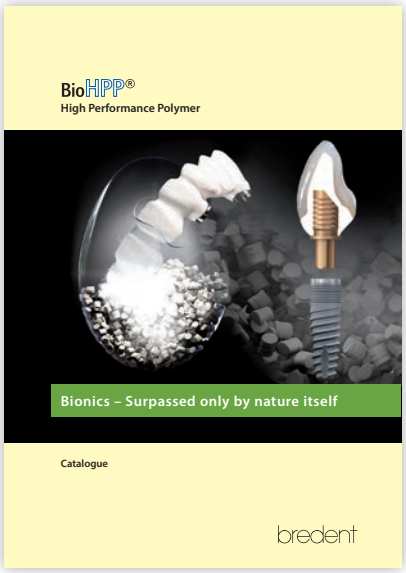

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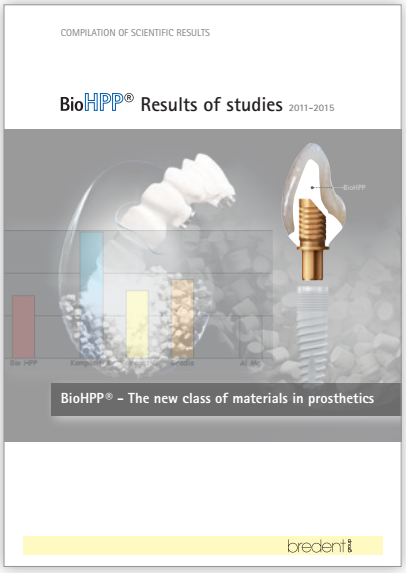

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SINCE 1974

bredent group

bredent GmbH & Co. KG
bredent medical GmbH & Co. KG
Weissenhorner Str. 2 · 89250 Senden · Germany
T: +49 7309 872-441 · www.bredent.com · @: info@bredent.com