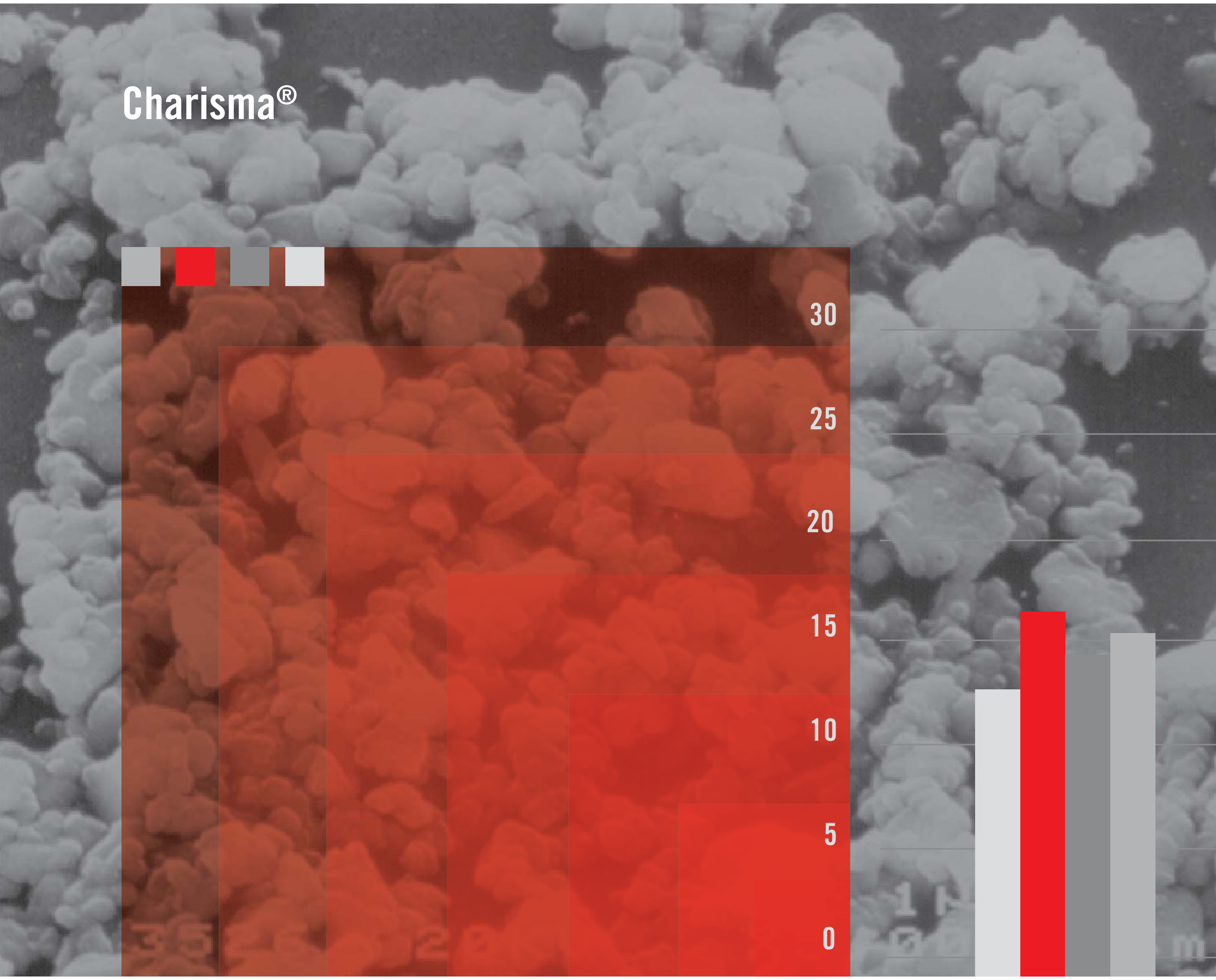
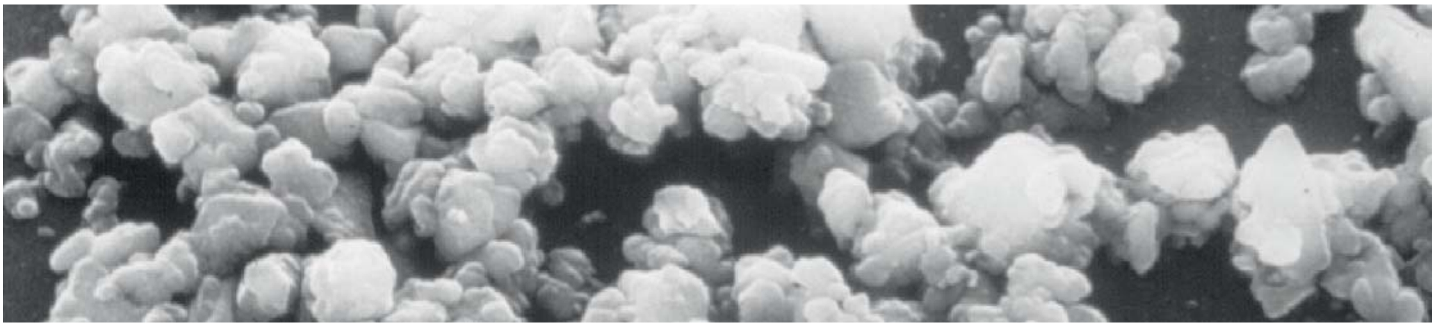
Heraeus

Charisma®



Scientific Information

Preface



Charisma was launched in 1991 by Heraeus Kulzer as a universal composite for anterior and posterior restorations and its composition has remained unchanged since then. As the manufacturer from Charisma, we take this opportunity to look back on this successful period, which is unusual in modern dentistry where the majority of dental composite filling materials have a much shorter "half-life".

15 successful years on the market and millions of fillings placed indicate that Charisma was already way ahead of its time when launched and set the gold standard for hybrid composites. Charisma looks back on a high proved, long-term clinical experience.

This long-term proof is important for you as dental professional, as it is your aim to provide patients with high-quality, long-lasting restorations. This is also relevant, as patient's expectations on the dental treatment are very high nowadays.

That is why Charisma has been adapted, during its long market presence, to all current demands of the dental world and of patients. Charisma was developed further and enhanced, e.g. its original shade range was expanded from 10 to 23 shades.

The following scientific information is meant to summarise Charisma's success story and give you detail information on the composition and contents of Charisma. It also includes an overview of completed studies and publications on the product.

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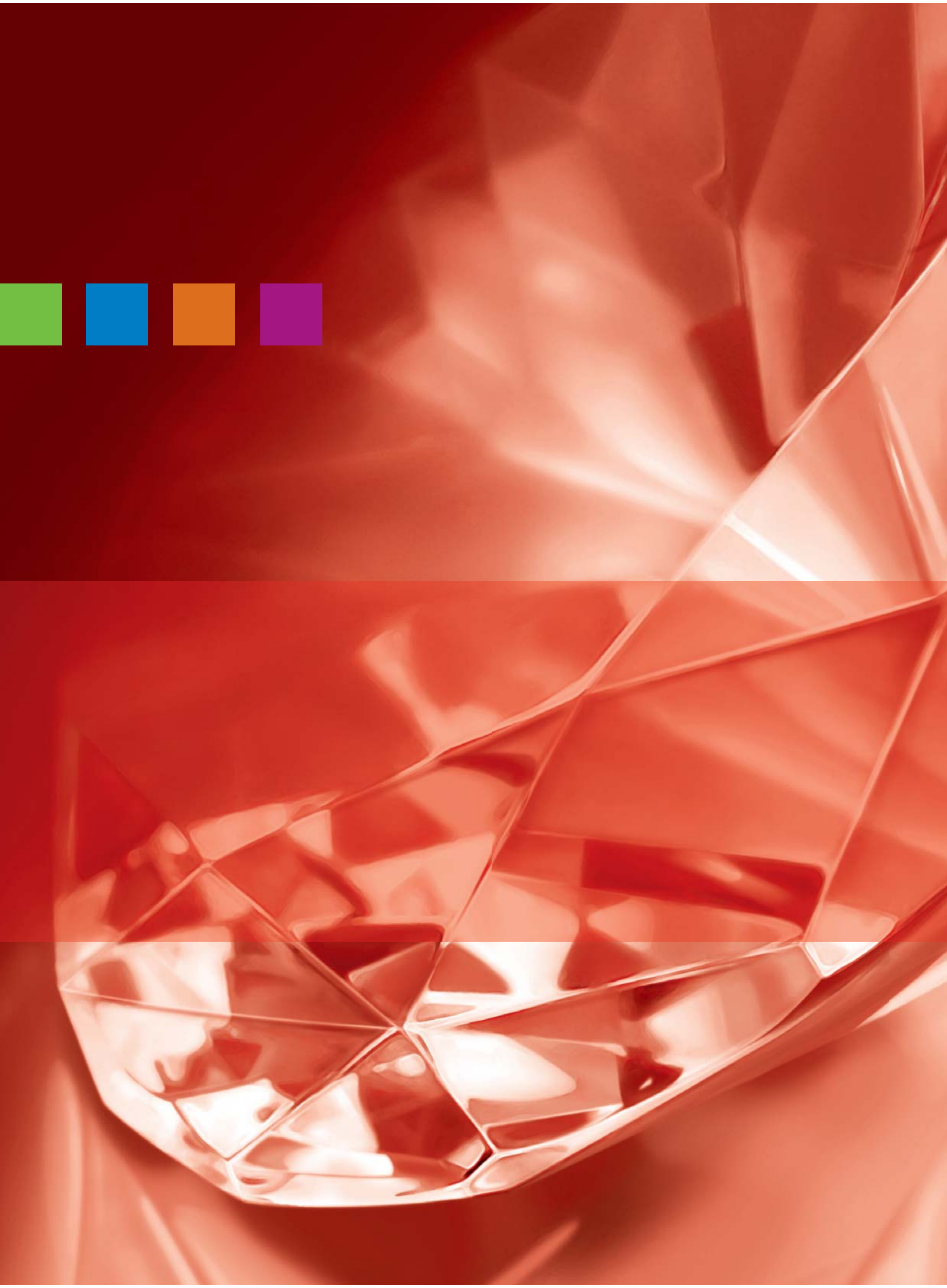


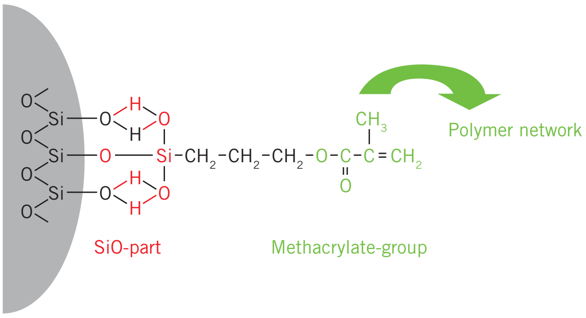
Introduction

Dentistry's desire to restore decayed teeth with tooth-coloured materials is almost as old as dentistry itself. Composites have been used for this indication for more than 25 years.

The term "composite" actually only refers to the fact that the material is composed of several components, i.e. at least 2 different phases (e.g. monomers and fillers). According to this broad definition, glass-ionomers, compomers, resin-based composites and ormocers are included in this group. They all have something in common – they cure to form a polymer network with glass, quartz or ceramic filler particles embedded in it.

In the narrow sense, "composite" is used to describe resin-based composites – this is what is meant when the following text refers to "composite". Composites are based on polymerisable monomers (e.g. Bis-GMA, TEGDMA, ormocer monomers, UDMA) reinforced with various sizes and types of filler particles.

Inorganic fillers have to be added to the monomer system to attain the degree of strength which enables resin based composites to be used in stress bearing posterior areas. Filler particles of the same size are not usually used. Instead – mixture of filler particles (fractions) containing various sizes and particle distributions are more common incorporated in the composite materials to ensure that as much filler as possible is integrated into the monomer matrix. As the volume of inorganic fillers is constant, the residual polymerisation shrinkage is reduced to a minimum.



The structure of a silane molecule

The filler particles are not only bonded mechanically to the monomer matrix, they also undergo chemical bonding with it. These molecules – called silanes due to their chemistry (word made up from Silicone and Methane) – exhibit two different functional groups. On one side, the silane molecules react with the SiO groups on the surface of the filler and are polymerised into the growing network via the methacrylate group on the other side of the molecule.

The reinforcement of the filler particles depends on their chemistry (e.g. silicic acid, quartz or glass filler particles) as well as the particle size and distribution. In general, the harder and larger the particles, the higher the strengthening effect (but: the worse the polishing properties). Only the correct combination of different filler particle fractions produces optimum mechanical and polishing properties.

Composites are categorised according to their viscosity, basic chemistry, curing mechanism or the size of the filler particles used. The most common type of classification involves the filler particle sizes – it actually mirrors the "evolution" of composites.

Macro-Filled Composite

The wear principle of macro-filled composites

The name macro-filled composite actually expresses all the important points about the structure of the filler particles: these “large” filler particles are considered to have a mean diameter of 5–10 µm. Although the glasses used for this purpose exhibit extremely high physical properties in the form of compact solid bodies, when embedded in a resin matrix to create a composite filling material these materials undergo considerably higher abrasion.

What is the explanation for this? Abrasion phenomena do not primarily affect the filler particles, but rather the resin matrix. The matrix is worn down, until more than 50% of the circumference of the filler particles is exposed. These exposed filler particles are then dis-lodged from the matrix, leaving “potholes”.

When the filler particles are dislodged, further filling material is lost which manifests clinically as abrasion. The size and relative number of sharp edges of the filler particles have a decisive effect on their retention under loading.

This process is comparable with the rocky coastline which is fully exposed to the stormy sea: Breaking waves rip stones out of the coastline to expose adjacent “filler particles” which are then dislodged by the following waves. The coastline recedes in a similar manner to which filling material abrades.

The size of the filler particles also has a negative effect on the polishing properties of filling materials: Macro-filled composites are virtually impossible to polish after trimming; a highlustre can only be created on the surface by pressing a strip of cellophane over it to smooth it during the curing process.

Filling materials were then enhanced to reduce the size of the filler particles thus counter-acting these wear phenomena and enhancing the polishing properties. As the minimum particle size was limited by the mills available at that time, it was decided to use flame pyrolitic manufacturing processes to produce small filler particles (0.05-0.1 µm) from SiO_2, i.e. so-called micro-filler particles.

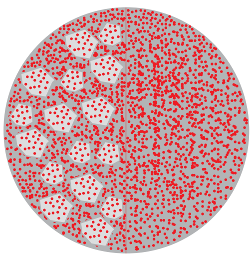
Micro-Filled Composite

Again, the name is self-explanatory: the filler particles are all extremely small. Due to the size of these filler particles, micro-filled composites can be polished to a higher lustre and their smaller surface area helps prevent the filler particles being dislodged from the matrix. This can be seen clearly in the picture of an historical footpath: People have been walking over it for 500 years; all filler particles have been polished to a high lustre but none have been dislodged. This prevents large "potholes" forming (as described before).

However, the advantages of smooth surfaces and improved wear properties are gained at the expense of considerably reduced fracture toughness. As the surface area of smaller filler particles is larger in comparison to their volumes, they cannot fill to such a high density as macro-filled composites. This leads to higher polymerisation shrinkage. Those micro-filled composites containing solely pyrogenic silicic acid filler particles are called ho-mogeneous micro-filled composites.

A new technical method, developed by Heraeus Kulzer at the end of the 70's, was used to increase the filler content despite this: finely milled, pre-polymerised micro-fillers were added to micro-filled composite in addition to the pure SiO_2. Homogeneous micro-filled composite was turned into inhomogeneous micro-filled composite, which contained pre-polymerised micro-filled composite constituents in the form of "organic macro-fillers". This enabled the polymerisation shrinkage to be reduced to an acceptable level but with-out compromising the excellent polishing properties and elasticity.

Inhomogeneous Micro-filler composite



Homogeneous Micro-filler composite

Schematic comparison:
Homogeneous versus inhomogeneous micro-filled composite

A historical footpath in Teguise, Lanzarote – shows the micro-filled composite principle

The inhomogeneous micro-filled composite concept has been proven for anterior restorations and still applies today. Durafill® VS composite is a classic member of this group – it has been used successfully in clinical practice for almost 30 years.

Despite this, one has to admit that even inhomogeneous micro-filled composites are not strong enough to be placed in regions exposed to masticatory loading. This was not possible until a combination of small to ultra fine solid quartz, glass or ceramic filler particles were added to create hybrid-composites.

Hybrid-Composite

The principle of hybrid filled composite

The name hybrid-composite describes clearly that the fillers consist of different components: The optimum physical properties of the glass “macro” filler particles and the outstanding polishing properties of the pyrogenic silicic acid micro-filler particles enable the advantages of both groups to be combined. There are no drawbacks worth mentioning – which meets demands more effectively than usual!

The above picture shows how large and small filler particles were combined optimally to build a wall which has remained stable for centuries.

Also, continual improvements in milling technology for filler particles have enabled their diameters and sharp edges to be reduced considerably.

Whereas the term hybrid-composite mainly describes the composition of different filler particles, the classification also denotes the mean size of the filler particles it contains:

- **Hybrid-composite**
  mean filler particle size up to 10 µm
- **Fine particle hybrid-composite**
  mean filler particle size up to 5 µm
- **Ultrafine particle hybrid-composite**
  mean filler particle size up to 3 µm
- **Submicron hybrid-composite**
  mean filler particle size less than 1 µm

Charisma is a typical submicron hybrid-composite. The mean size of the patented, barium Microglass filler particles is 0.7 µm and the maximum particle size less than 2.0 µm.

The first hybrid-composites for dental restorations were launched at the end of the 80’s. This market presence set a milestone in the development of adhesive filling materials: The significant better physical characteristics (e.g. fracture toughness) of hybrid-composites made it possible, for the first time, to build big anterior restorations as well as complex class II fillings with good longevity prognosis.

Charisma was one of the first universal submicron hybrid-composites for anterior and posterior indications that set new standards at its launch time in 1991.

Nano-Composite

The first “real” nano-composites exist since 2003. They differentiate from hybrid-composites through their nano-metrical fillers, which are smaller than 0.1 µm = 100 nm. The first nano-composites were already developed in the 70’s; they are the “inhomogene-ous micro-fillers”, which are now called “inhomogeneous nano-filler composites”. From this point of view, Durafill VS from Heraeus Kulzer was already one of the first nano-composites.

The particles found in the current nano-composites differentiate from fillers in “inhomogeneous micro-fillers”, because they permit a very high filler content of up to 85%. This higher filler content leads to reduced shrinkage and higher wear resistance of the compos-ites. Nano-particles also achieve enhanced transparency and aesthetics.

Nano-composites can be divided in nano-fills and nano-hybrids: Nano-fills contain only nano-particles, which can be agglomerated. Nano-hybrids, on the other hand, combine bigger fillers with isolated nano-fillers for filling the voids between bigger particles.

There is not enough clinical experience and studies on nano-filler composites, yet – it can be expected, though, that they will show positive results.

COMPOSITION

Monomer System

Charisma is a traditional Bowen composite containing the following monomers:

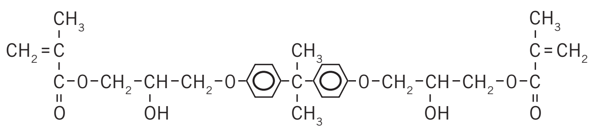
- **Bis-GMA**
- **TEGDMA**

Bis-GMA (bisphenol-A-glycidylmethacrylate) is a tough, highly viscous monomer which provides useful "adhesive properties" for the filler particles. The aromatic rings of Bis-GMA monomer cause the molecule to be relatively stiff. This monomer has been proven for use in dental composites since decades.

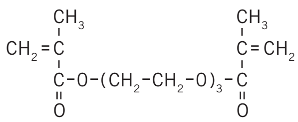
TEGDMA (triethyleneglycol dimethacrylate) acts as a reactive diluent to reduce the viscosity of the monomer mixture and complete cross-linking of the individual monomers. This provides the cured composite with good physical properties, high wear-resistance and a high fracture toughness capacity.

As only bifunctional molecules are used, a fairly tightly meshed network is formed – depending on the mixing ratio of the monomers. The cross-links form according to the statistical random principle.

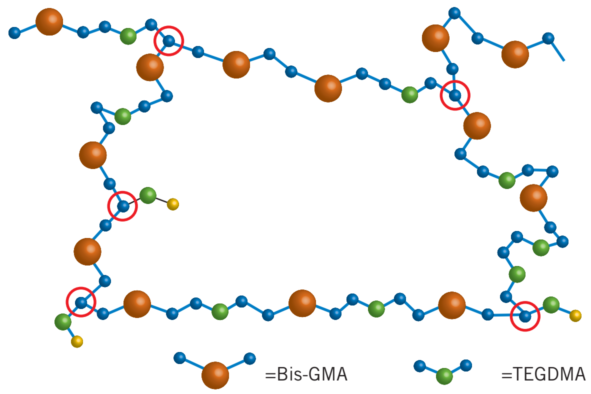
Bis-GMA



TEGDMA



The structural formulas of Bis-GMA and TEGDMA



Simplified diagram of Charisma's bifunctional molecule matrix

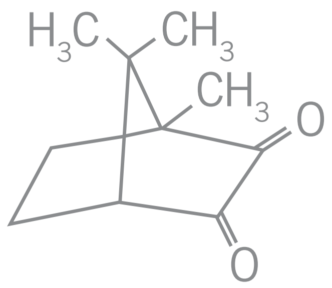
Initiators and Co-Initiators

The initiator in Charisma is camphorquinone.

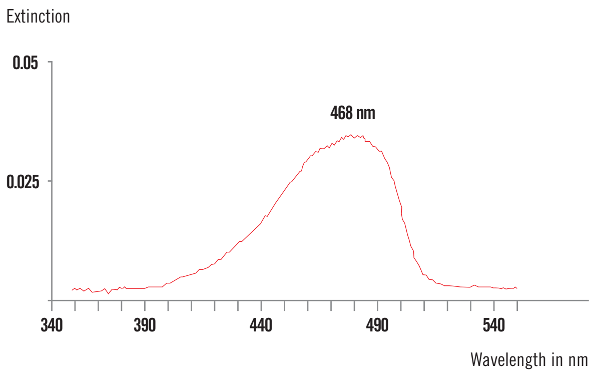
Under the effect of light quantums, camphorquinone forms radicals which “attack” the double bonds of the methacrylate groups and because of that start the polymerisation. The maximum absorption of camphorquinone is within the visible wavelength range, i.e. 468 nm.

The ratio of initiators to co-initiators in Charisma was selected to ensure that, on the one hand the material undergoes high quality polymerization and, on the other hand, the operator has adequate working time.

The curing times are 20 seconds for lighter shades and 40 seconds per 2 mm layer for darker/opaque shades. These times assume that a sufficiently powerful halogen or LED polymerisation lamp such as the Translux® Power Blue® is in use. The light output must not be less than 400–500 mW/cm². When using a plasma light curing unit (with an output of >1,200 mW/cm²), the polymerisation time can be reduced by 25%.



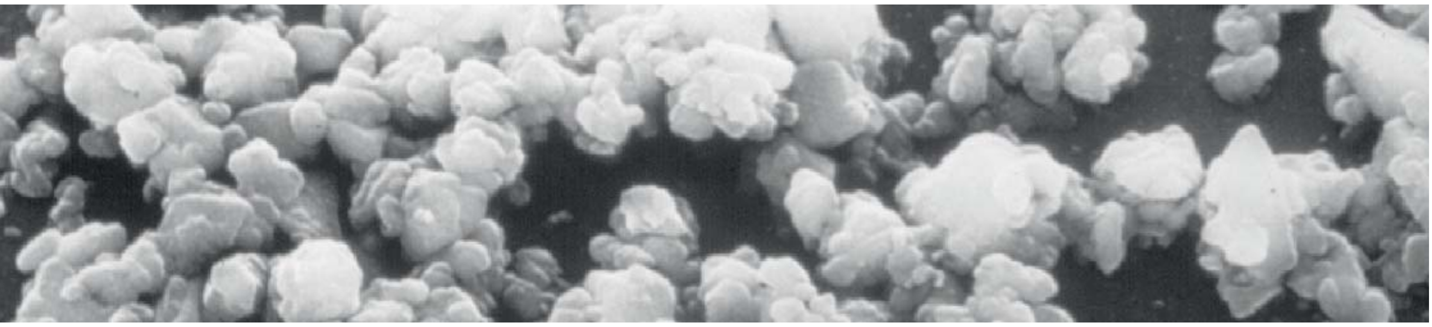
The structure of camphorquinone in Charisma



The absorption curve of camphorquinone in Charisma

COMPOSITION

Filler System



SEM image of Microglass-fillers

Two filler fractions are used in Charisma which exhibit different compositions and particle sizes:

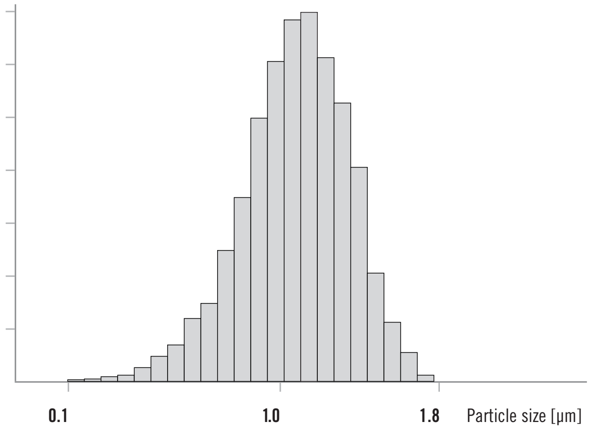
- **Ba-Al-B-F-Si Glass**
  (d_{50} = 0,7 µm d_{99} < 2 µm)
- **Pyrogenic SiO_2**
  (0,01–0,07 µm)

Barium glass (= Microglass®) with a compact structure and amorphous form is used. It provides Charisma with its high transparency and resulting excellent optical properties. The barium portion provides for radiopacity corresponding to an aluminium value of 200%.

The above picture shows a SEM image of the compact filler. The Microglass filler particles are packed tightly to ensure that Charisma can be polished to a high lustre quickly and easily.

The advantages of Microglass filler can be summarised as follows:

- Excellent aesthetics and chameleon effect
- Kind to the antagonist dentition
- Easy to polish
- Radio-opaque



Particle distribution of Microglass

Apart from Microglass filler, pyrogenic SiO_2 is also added to Charisma to prevent sedimentation of the glass filler particles and to fill the spaces between the compact barium glass filler particles. This provides for the high packing density of 78% filler content by weight (approx. 61% by volume).

Indications & Advantages

Charisma is an uncomplicated filling material, with which aesthetic and long lasting results can be achieved.

Charisma can also be combined with the low viscosity composite Charisma flow to cover all common indications: From posterior fillings subject to particular stress through to highly aesthetic anterior restorations. These two mutually matched materials are versatile allrounders and offer a high degree of reliability.

Thanks to Charisma's pronounced chameleon effect, patients' demands for aesthetically high-grade long-lasting restorations can be fulfilled.

Indications

- Fillings in Black's class I–V cavities
- Adjustments to contours and shades
- Diastema closures
- Restorations in deciduous teeth
- Correcting congenital tooth-defects (e.g. enamel dysplasia)
- Splinting traumatically mobilised teeth

Advantages – Natural aesthetics made easy

- Easy, fast handling
- Good modelling properties
- Natural like wear properties
- Maximum protection for the antagonists
- Excellent margin adaptation
- High X-ray opacity
- Pronounced chameleon effect
- Safe and fast colour selection (colour bar from original composite)
- Natural fluorescence
- Excellent polishing properties
- Excellent surface lustre
- Broad colour spectrum

in vitro studies

IN VITRO STUDIES

Changes in the shades of filling and veneering composites caused by brief exposure to UV light

Veränderung der Farbe von Füllungs- und Verblendkompositen durch Kurzzeit-UV-Exposition
Source: M. Rosentritt, G. Handel, University of Regensburg/Germany; DZZ 53; 1998: 655-658 *

Objective:
The objective of this in vitro study was to evaluate the shade stability of veneering and filling materials after brief exposure to UV light.

Materials and Methods:
20 cylindrical specimens per material (dimensions: 5 x 6 mm) were produced using the appropriate light curing units and the curing time recommended by the manufacturer. Following filling materials were tested: Durafill VS (Heraeus Kulzer), Z100 (3M Espe), Tetric (Ivoclar Vivadent), Charisma (Heraeus Kulzer) and Tetric Ceram (Ivoclar Vivadent). All specimens were roughened with increasing grit sizes of sandpaper, up to 1,000 grit. 24 hours after the specimens had been produced, colorimetric recordings were taken (= zero recording). The specimens were then placed in an aging unit (Xenotest CPS+, Heraeus Kulzer) and subjected to combined aging consisting of UV light exposure (765 W/m^2 daylight at 160 Lux) and warmth. They were exposed for 20, 40, 60, 80, 100, 120, 180 minutes, and 24 hours. After being exposed to UV light for the required period, the specimens were measured colourimetrically with a dental chroma meter (CM-C3500, Minolta) using the L*a*b* shade system. Three recordings were taken per specimen, the mean value calculated and the shade difference determined as ΔE to the particular zero recording.

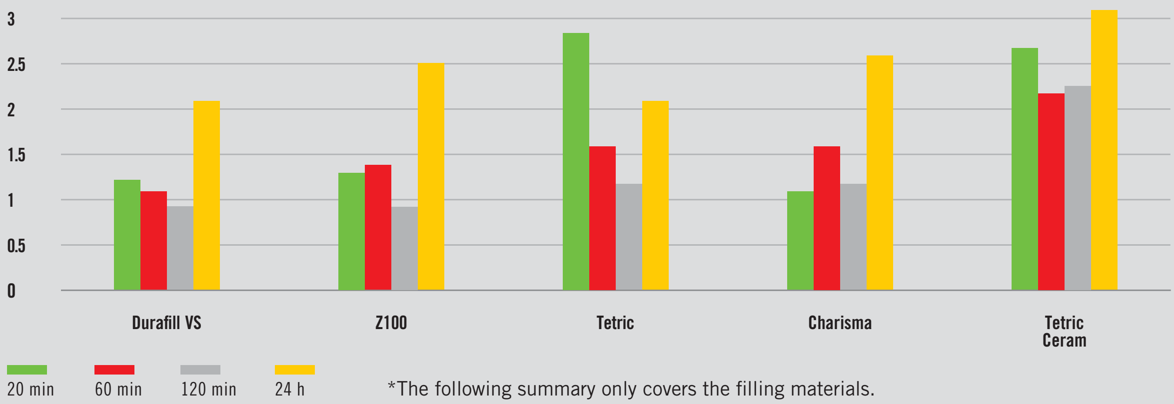
Conclusion:
The colour deviation after repeated brief exposure to UV light is higher in filling composites when compared to veneering composites. The influence of UV-stabilisers can be recognised

Note from Heraeus Kulzer:
Charisma showed the best colour stability within the group of the hybrid filling composites after up to 120 minutes UV light exposure.

Results:

The value of ΔE denotes the degree of shade deviation between the zero recording and shade change during the specific periods of exposure.

Colour differences in ΔE after artificial aging



*The following summary only covers the filling materials.

IN VITRO STUDIES

Two-body wear simulation in a computer controlled artificial mouth

Source: C. Schnabel, P. Daes, K.-H. Kunzelmann, R. Hickel, University of Munich/Germany;
J Dent R, Vol 73; 1994: 294, IADR-Abstract 1540

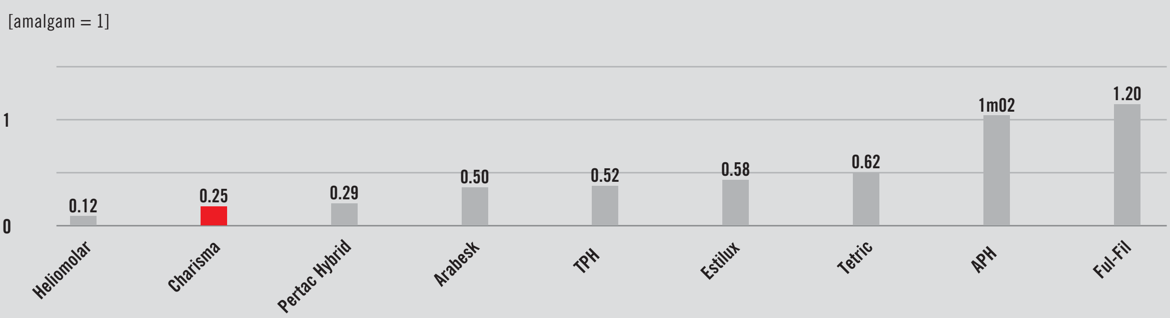
Objective:
The objective of this study was to simulate wear (two-body wear) to compare the wear-resistance of different composite materials with that of amalgam.

Materials and Methods:
Following composite materials were tested: Heliomolar (Ivoclar Vivadent), Estilux (Heraeus Kulzer), Charisma (Heraeus Kulzer), Pertac Hybrid (3M Espe), Tetric (Ivoclar Vivadent), Prisma TPH, Prisma APH and Ful-Fil (all DeTrey/Dentsply) as well as Arabesk (VOCO). 8 specimens were produced for each material. The surfaces of each specimen were smoothed with a 1,200 grit diamond trimmer. The specimens were immersed in water for 24 hours prior to being loaded with the "Pin on Block" machine. The opposing dentition was simulated with an Al_2O_3 pin (Degussit, Degussa, diameter 3 mm), which had been sandblasted with 50 µm Al_2O_3 prior to testing. The vertical loading on the Al_2O_3 pin was 50 N. After 50,000 cycles the surface was measured with a Perthometer to determine the average reduction in height. The average reduction was compared with that of amalgam – this was considered = 1.

Conclusion:
This two-body abrasion simulation indicated that most light cured hybrid composites, like Charisma, exhibit superior abrasion-resistance to amalgam. The reason may be the hardness of the fillers and the elasticity of the composite. It is important to realise that the specimens were loaded without the materials being aged

Results:

The relative abrasion of various filling materials compared to amalgam



Surface roughness of universal composite resins after two polishing methods

Source: S. Opaspun, C. Harnirattisai, University of Chiangmai and Mahidol/Thailand;
J Dent R Vol. 74; 1995: 524 IADR-Abstract 985

Objective:
The objective of this study was to test the surface roughness of three different composites with two different polishing methods.

Materials and Methods:
The following composites were tested: Z100 (3M Espe), Charisma (Heraeus Kulzer) and Prisma TPH (Detrey/Dentsply). 15 specimens were produced from each material and divided into 3 groups. 5 specimens from each group were polished with Soflex disks (3M Espe) and 5 with the Enhance polishing system (DeTrey/Dentsply). The remaining 5 were polymerised under cellophane strips and remained unpolished (control specimens). The surface roughness was determined with a Perthometer. The figure below shows the mean surface roughness (RZ) of the 3 different filling materials in the various groups.

Conclusion:
It was found, that surface roughness of polished universal composites is depended from composite type and polishing method.

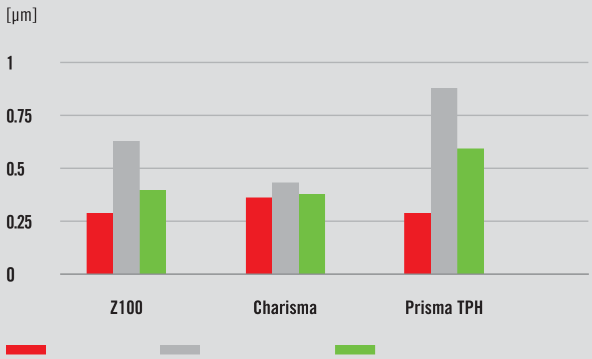
Note from Heraeus Kulzer:
In this study Charisma showed very good surface roughness results with both polishing systems, whereby Charisma's excellent polishability was confirmed.

Results:

The mean surface roughness of Charisma was identical for both polishing methods and comparable with that of Z100, assuming this was polished with the Enhance polishing system. Statistically, the results did not differ from those of the control specimens.

The surface roughness values of Prisma TPH did not attain those of the unpolished control specimen using either of the two polishing methods.

Surface smoothness of different composites with different polishing systems



IN VITRO STUDIES

Comparison of the fluorescence of natural teeth and 6 different composites

Comparação da fluorescência de dentes naturais e seis resinas compostas
Source: R. Neumann, A. Rist, A. Grundler, Heraeus Kulzer/Germany; 17. Congresso Internacional de Odontologia do Rio de Janeiro, Brasil, 2005

Introduction:
Fluorescence is the capacity of some crystalline bodies, like enamel and, mostly, dentine, to emit light, when exposed to a special type of illumination. This characteristic becomes relevant, when patients are exposed to ultraviolet light, e.g. in night clubs. If the light emitted from the restoration is not similar to that of the natural dentine, the restoration will appear darker or will completely disappear. The natural, day-light spectrum also encloses ultraviolet rays, so that the above mentions phenomenon is also important under sun light.

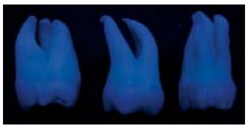
Objectives:
Optical comparison and determination of fluorescence differences between natural teeth and six different composite materials of shade A3.

Materials and Methods:

Shade:

A3 A3 A3

Fluorescence level:



high middle low

25 chosen, extracted molars from shade A3 were analysed under ultraviolet light and separated in three fluorescence groups (low, middle and high) by two calibrated testers.
Class II cavities were prepared in three specimens of each group and restored with following composites also from shade A3 (or equivalent): Charisma (Heraeus Kulzer), Tetric Ceram (Ivoclar Vivadent), EsthetX (Dentsply), Filtek Supreme (3M Espe), Durafill VS (Heraeus Kulzer), and Ice (SDI). The teeth were photographed under ultraviolet light (Fuji Finepix S7000 = and the fluorescence level of the composite in comparison to the natural tooth was classified.

Conclusion:
It is impossible for a composite restoration to show exactly the same fluorescence level as the natural tooth in any case, because natural teeth show individual fluorescence levels even when they have the same colour (shade) under day light. Even though the fluorescence of Charisma, Tetric Ceram, EsthetX, and Durafill VS is not able to be adapted to each tooth to be restored, it is sufficient to let the restoration look natural under day light as well as ultraviolet light.

Results:

Product name	Fluorescence level of the composite material		
	Teeth with low fluorescence	Teeth with middle fluorescence	Teeth with high fluorescence
Charisma	high	middle	middle
Tetric Ceram	high	high	high
EsthetX	middle	middle	high
Filtek Supreme	low	low	low
Durafill VS	high	high	middle

in vivo studies

2-year clinical performance of eight direct class 2 restorative materials

Source: S. L. Smith, D. K. Hein, T. A. Morrow, C. I. Cordner, D. R. Woods, R. P. Christensen, Clinical Research Associates/USA;
Journal of Dental Research 75; 1996: 256, IADR-Abstract 1907

Objective:
This study involved testing the performance of 8 filling materials recommended for direct class II fillings.

Materials and Method:
Following materials were tested: Experimental (EX), Beta Quartz-Restolux SP-4 (BQ) (Lee Pharmaceuticals), Charisma (CH) (Heraeus Kulzer), Conquest (CO) (Generic Pentron), Pertac Hybrid (PH) (3M Espe), Prisma TPH (TP) (Dentsply), Tetric (TE) (Ivoclar Vivadent) and Z 100 (Z1) (3M Espe). Each filling material was used to fill 52 cavities in molars (1/3 of the fillings had buccal or lingual extensions or partial cusps; half the fillings were 2 or 3 surface standard fillings). The manufacturer's instructions were followed exactly and the recall appointment procedure standardised. Following criteria were evaluated in vivo: shade match (CM), marginal discolouration (MD), interproximal contact (IC), caries (C), postoperative sensitivity (POS) and the necessity for endodontic treatment (EN). Following criteria were evaluated in vitro: marginal adaptation (MA), surface smoothness (SS), fracture (B) and wear (W). The abrasion was determined quantitatively (CRA measuring system, IDR 69:126 # 190 '90).

Conclusion:
All in all, after 2 years Charisma produced the best results for 4 of the 6 criteria (fracture, marginal adaptation, surface smoothness, shade match, marginal discoloration) which showed significant differences. In addition, Charisma was at the top of the summarised analyses.

Results:

The mean 2-year grades [1 = Alpha (top), 2 = bravo, 3 = Charlie, und 4 = Delta (worst)] and results are listed below (Table 4.1). The performance of the material did not depend on the size of the restoration. A list of priority of the statistically significant parameters was prepared for the 8 materials. The total list of priority was calculated as being the mean value of the statistically significant list of priority. The AOV and Fisher's ‚LSD Method' produced significant differences (p<0.5) for (W), (B), (MA), (SS), (CM) and (MD).

Abrasion Wμm	Füllungsfraktur B % delta	Randständigkeit MA	Oberflächenglätte SS	Farbanpassung CM	Randverfärbung MD	Total
Conquest 64	Experimental 0.0	Charisma 1.3	Charisma 2.4	Charisma 1.3	Charisma 1.1	Charisma 3.5
Z100	Prisma TPH 1.9	Beta Quartz-Restolux 1.6	Conquest 2.6	Prisma TPH 1.3	Conquest 1.2	Tetric 4.0
Tetric 75	Beta Quartz-Restolux 5.8	Tetric 1.6	Tetric 3.0	Tetric 1.4	Tetric 1.3	Conquest 4.5
Charisma 79	Tetric 5.8	Prisma TPH 1.8	Z100 3.2	Z100 1.5	Pertac Hybrid 1.3	Experimental 4.7
Experimental 87	Pertac Hybrid 7.7	Experimental 1.9	Pertac Hybrid 3.4	Conquest 1.5	Z100 1.3	Pertac Hybrid 4.7
Prisma TPH 100	Charisma 9.6	Pertac Hybrid 2.0	Experimental 3.5	Pertac Hybrid 1.5	Prisma TPH 1.3	Prisma TPH 4.8
Pertac Hybrid 116	Z100 9.8	Conquest 2.4	Prisma TPH 3.5	Experimental 1.5	Experimental 1.4	Z100 4.8
Beta Quartz-Restolux 165	Conquest 17.3	Z100 2.4	Beta Quartz-Restolux 3.9	Beta Quartz-Restolux 1.7	Beta Quartz-Restolux 1.5	Beta Quartz-Restolux 55

IN VIVO STUDIES

Clinical recall examinations (5-year study) of posterior restorations placed chairside

Klinische Nachkontrolle (5-Jahres-Studie) von Chairside Versorgungen im Seitenzahngebiet.
Source: K. Vollandt, G. Voigtsberger, E. Glockmann, I. Hoyer; University of Jena/Germany;
15. Jahrestagung der DGZ, Cologne, abstracts scientific lectures 2001:48

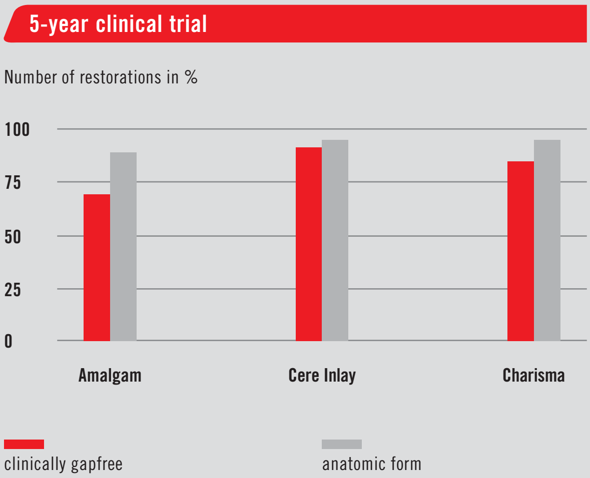
Objective:
The objective of this study was to clinically evaluate fillings placed with a submicron hybrid-composite (Charisma), a non-gamma 2 amalgam (Tytin) and Cerec-I inlays (Vita Cerec Mark II) in class II cavities.

Materials and Methods:
All Charisma fillings and Cerec inlays were placed under rubber dam and the amalgam fillings were placed in relative isolation, as described by their manufacturers. Deep cavities were lined with an adequate sub base. 5 years later, 63 Charisma fillings, 45 amalgam fillings and 28 Cerec inlays were available for recall examinations. The restorations were evaluated using the USPHS and CPM criteria for marginal fit, anatomical contouring, shade reproduction, abrasion, ledging, marginal discolouration and clinical acceptance.

Conclusion:
The results of this study show that, concerning marginal adaptation, secondary caries and replacement rate, under optimum working conditions Charisma submicron hybrid-composite fillings are virtually equivalent to Cerec inlays and actually superior to amalgam restorations.

Results:

During the 5 years, 9 of the original 67 amalgam fillings had to be replaced due to fracturing or failure. Only one Cerec inlay and no Charisma fillings whatsoever had to be replaced.



Clinical Application

Anterior Restorations

The following 2 cases are examples of Charisma restorations.

Clinical case: Dr. Markus Balkenhol, University of Gießen/Germany

A 30-year-old patient presented with a fractured incisal edge on tooth 11.

Once the tooth had been cleaned with a non-fluoride polishing paste, the shade was taken with the Charisma shade guide, which is made of original material permitting an easy and accurate shade selection.

The incisal edge was then smoothed and the enamel bevelled approximately 1–2 mm toward the vestibular aspect. This ensures harmonious shade transition between the tooth and filling material. The palatal surface was also slightly bevelled.

The 3-step adhesive GLUMA Solid Bond system was used for this case. The enamel and dentine were etched for 15–30 seconds with GLUMA Etch 20 before rinsing off the etching gel carefully. The tooth surface is then dried. The frosted white enamel surface is an indication that etching was successful.

Tooth 11 has a fractured incisal edge

The incisal edge was smoothed and bevelled

Palatal view of tooth 11

Etching the enamel and dentine

CLINICAL APPLICATION

Anterior Restorations

The tooth surface was coated thoroughly with GLUMA Solid Bond Primer, which was then allowed to react for 15–30 seconds before being dried completely with an air syringe until the surface of the tooth was shiny.

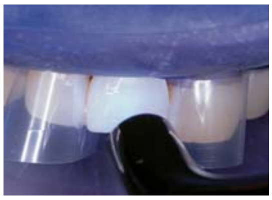
Once the surface of the tooth was dried, GLUMA Solid Bond Sealer was applied. It is a filled bonding agent, which contains the same glass filler as Charisma. The glass filler increases the viscosity of the sealer and reinforces it.

The sealer was then polymerised for 40 seconds with a Translux Energy light curing unit.

Once the tooth surface was treated with bonding agent, the first layer of Charisma was applied. One begins by applying layers of Charisma opaque (in this case, shade: OA2) to the palatal surface and building them almost up to the incisal edge. Each 2 mm layer was polymerised for 40 seconds.

Applying GLUMA Solid Bond Primer

Applying GLUMA Solid Bond Sealer



Light curing for 40 seconds with a Translux Energy

Building up the palatal layer with Cha-risma opaque, shade OA2

CLINICAL APPLICATION

Anterior Restorations

It is important to use the opaque shade (= dentine shade) to prevent the dark background of the mouth shimmering through. Otherwise, the filling would look greyish. Only the incisal and buccal areas are coated with transparent main shade (= enamel shade) – in this case A2. In this case, no extra transparent incisal material was applied as the adja-cent tooth was also not exceptionally transparent.

On the buccal surface, the uppermost layer must consist of transparent main shade to permit the light to penetrate it a little before being reflected by the Charisma opaque layer. This creates life-like aesthetics.

The reconstruction of the lost tooth structure was facilitated through the good modelling characteristics of the compo-site material, which can be noticed during the layering process.

Charisma main shades must be cured for 20 seconds per 2 mm layer. Once the final layer was cured, the rubber dam was removed and the filling re-contoured with finishing diamonds and Soflex-Disks.

The high lustre was achieved with diamond polishing paste. The picture shows that a natural high lustre can be achieved. The patient did not want the mesial incisal defect on tooth 22 to be restored during the treatment.

Building up the incisal and buccal areas with Charisma, shade A2

Shows the filling after finishing with finishing diamonds and Soflex-Disks

Shows the filling in tooth 11 after high lustre polishing

CLINICAL APPLICATION

Posterior Restorations

Clinical case: Dr. Jürgen Garlichs, Kiel/Germany

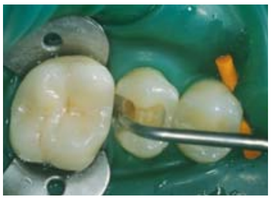
In the second case, a female patient presented a fractured occluso-distal amalgam filling in tooth 15. Tooth 14 had been restored with a three-surface composite filling and tooth 16 with galvano crown.

A rubber dam was placed and the amalgam filling removed. The cavity was then coloured with caries detector, the caries excavated and the cervical cavity margins smoothed with an ultrasonic tip.

To restore the proximal contact area, a partial matrix was placed and wedged with wooden wedges. GLUMA Etch 20 was then applied, beginning with the enamel and spreading it to the dentine. The etching gel was allowed to react for 15–30 seconds before being rinsed off carefully – the excess water was removed from the cavity with an air syringe.

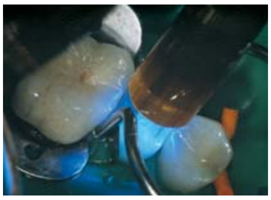
Once the entire GLUMA Solid Bond system had been applied, it was light cured for 40 seconds.

A fractured amalgam filling in tooth 15



Tooth 15 after removing the amalgam filling

Etching the entire cavity with GLUMA Etch 20



Light curing the bonding agent

CLINICAL APPLICATION

Posterior Restorations

Charisma was then placed in the cavity in layers of up to 2 mm and each layer cured separately.

Severely discoloured dentine (e.g. due to amalgam or tertiary dentine) must always be overlaid with Charisma opaque shades to mask the discoloration. Otherwise, the Charisma main shades can be used as the chameleon effect of Charisma permits the restoration to adapt to the tooth shade. Handling is easy and fast in both cases.

A plugger was used to form the proximal area against the matrix and create a firm proximal contact area. The final layer was contoured with a spatula and cured.

The first layer of Charisma has been placed

The second layer of Charisma has been placed

The filling material is pressed against the matrix

Contouring the occlusal surface

Posterior Restorations

Once the matrix band had been removed – with the rubber dam in place – the filling was trimmed before being smoothed with a silicone polisher. Flexible disks with successively decreasing grit sizes are best indicated for the proximal region. Soft silicone polishers were used for achieving natural high lustre in a very fast way.

The picture shows the finished restoration in tooth 15 and after checking the occlusion.

Smoothing the occlusal surface

The finished filling in tooth 15 after removing the rubber dam

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In compilance with the European guideline 93/42/EWG our medical devices are CE-marked according to the classifications.

Notes:
All graphs and page titles were provided by Heraeus Kulzer.
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The studies are presented in an abridged version.
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