3M

Filtek™
Supreme
Flowable Restorative

Technical Data Sheet

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Introduction

3M's global leadership in restorative dentistry is defined by more than 50 years of innovation.

The most notable achievement was the creation of a unique new category of dental material in 2002—the nanocomposite.

3M launched their first flowable nanocomposite with 3M™ Filtek™ Supreme Plus Flowable Restorative in 2005, incorporating the filler technology of 3M™ Filtek™ Supreme Universal Restorative. In 2010, 3M™ Filtek™ Supreme Ultra Flowable Restorative was created, improving the former Filtek Supreme Plus Flowable restorative by combining the strength and esthetics of the enhanced 3M™ Filtek™ Supreme Ultra Universal with the "flow-on-demand" handling of Filtek Supreme Plus Flowable Restorative.

Building on dentists' insight and our clinically proven technologies, we designed a new 3M™ Filtek™ Flowable Syringe.

Through global customer research, and discussions with general dentists and opinion leaders, it was identified that flowable composites can be prone to bubbles and run-on during dispensing. In response, 3M has introduced a new ergonomic syringe design.

Improvements

- Bubble and run-on reduction
- Ergonomic syringe design
- Bendable cannula (20 gauge)
- Material volume indicator
- Safe to warm* and injection mold

In addition to the improvements, 3M is branding Filtek Supreme Ultra Flowable Restorative under the new global brand, 3M™ Filtek™ Supreme Flowable Restorative. This standardization helps to ensure that the Filtek values are presented in a consistent manner in all markets and strengthen our communication with dentists worldwide.

*Up to 70°C (158°F) for up to 1 hour, up to 25 times.

2002
3M™ Filtek™ Supreme Restorative

2005
3M™ Filtek™ Supreme Plus Flowable Restorative

2010
3M™ Filtek™ Supreme Ultra Flowable Restorative

2020
3M™ Filtek™ Flowable Syringe

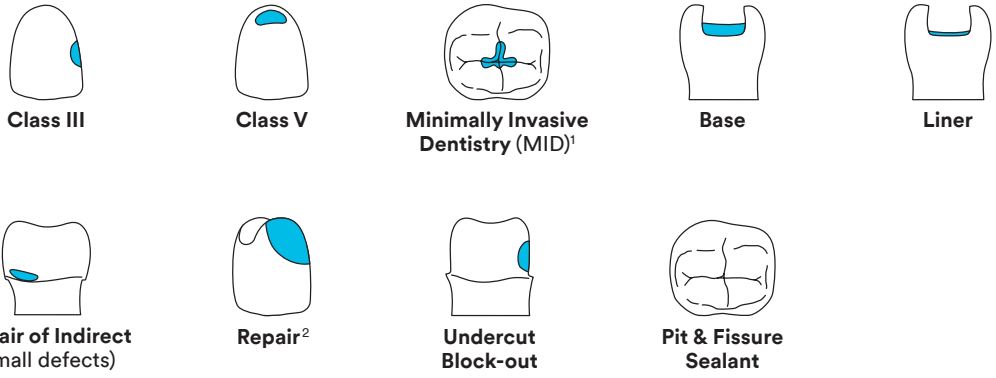
Product Description

3M™ Filtek™ Supreme Flowable Restorative is a low viscosity, visible light activated, radiopaque, flowable nanocomposite. The restorative is packaged in syringes and capsules. It is available in a variety of tooth-colored shades. The shades offered with Filtek Supreme Flowable Restorative were designed to coordinate with shades offered with 3M™ Filtek™ Supreme Ultra Universal Restorative and 3M™ Filtek™ Universal Restorative.

Indications for Use

3M™ Filtek™ Supreme Flowable Restorative

(Incremental up to 2mm)



Class III | **Class V** | **Minimally Invasive Dentistry** (MID)[1] | **Base** | **Liner**

Repair of Indirect (small defects) | **Repair**[2] | **Undercut Block-out** | **Pit & Fissure Sealant**

1. Including small, non stress-bearing occlusal restorations.
2. Repair of acrylic temporary and composite resin.

Composition

Filtek Supreme Flowable Restorative contains Procrylat, BisGMA and TEGDMA resins. The fillers are a combination of a non-agglomerated/non-aggregated surface modified 20nm silica filler, a non-agglomerated/non-aggregated surface modified 75nm silica filler, a surface modified aggregated zirconia/silica cluster filler (comprised of 20nm silica and 4 to 11nm zirconia particles) and ytterbium trifluoride filler with a range of particle sizes from 0.1 to 5.0µm. The aggregate has an average cluster particle size of 0.6 to 10µm. The total inorganic filler loading is approximately 65% by weight (46% by volume).

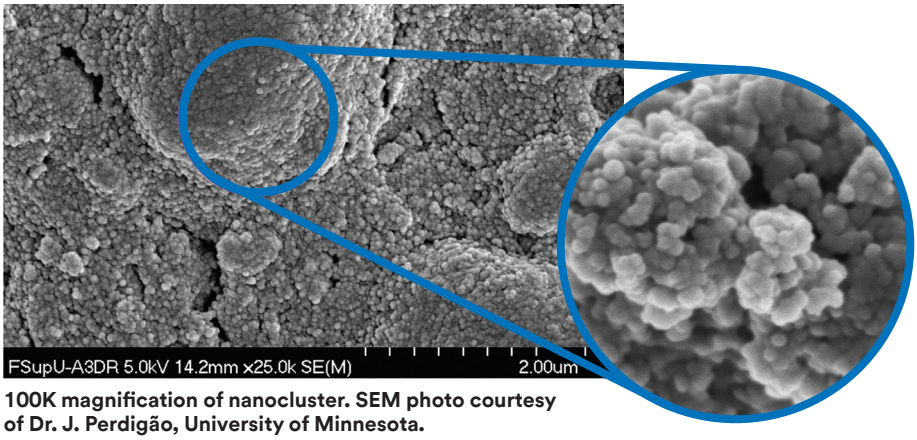
Background Information

Fillers/Nanotechnology

3M is the only company in the dental industry that has patented TRUE nanofiller technology, which means we have the only TRUE nanocomposites on the market.

The significant distinction between 3M™ Filtek™ Supreme Flowable Restorative (a TRUE nanocomposite) and microhybrids/nanohybrids is that our nanoparticles are uniquely formed from sub-100nm particles and are not the result of a grinding process.

Most nanoparticles are fused into nanoclusters, protecting well against wear. These spherical fillers can be removed slowly layer by layer instead of plucking out as a whole particle under wear. This leaves a smoother, less wear sensitive surface, which can be seen for instance as higher gloss after toothbrush abrasion. Additionally, the nanoclusters are around 1–3µm in size, which allows a high filler loading and results in excellent physical and handling properties.



100K magnification of nanocluster. SEM photo courtesy of Dr. J. Perdigão, University of Minnesota.

TRUE nanotechnology gives Filtek Supreme Flowable Restorative excellent wear resistance and polish retention, a key differentiator between it and competitive nanohybrids, microhybrids and microfills.

Resin System

One of the key features of flowable restoratives is their flow properties. The ability to wet the surface of cavities quickly and with minimal instrumentation defines this filling material category. These materials are used as liners, as well as actual filling materials for small restorations. Besides flowable handling, these materials must possess adequate physical properties, such as strength and wear resistance, to ensure clinical success in a variety of indications.

The challenge to creating these materials is achieving a clinically acceptable balance of properties. Frequently modifications that produce a flowable restorative (lower viscosity) adversely affect strength, wear resistance and shrinkage.

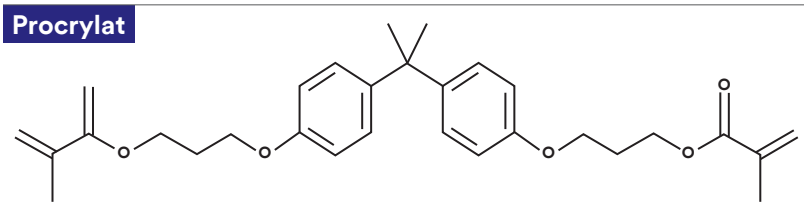
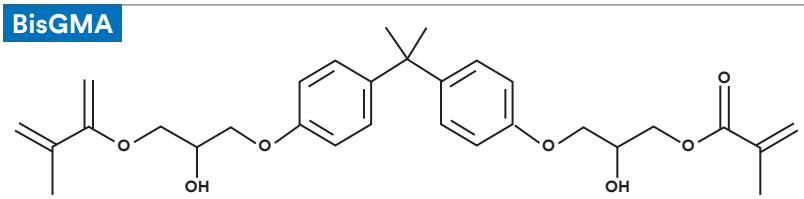
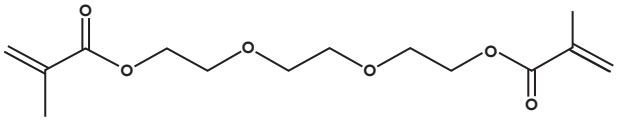
Procrylat		**High molecular weight hydrophobic and low viscosity main monomer.**
BisGMA		**High molecular weight hydrophilic and high viscosity monomer.**
TEGDMA		**Low molecular weight, low viscosity monomer.**

Table shows monomers used in 3M™ Filtek™ Supreme Flowable Restorative.

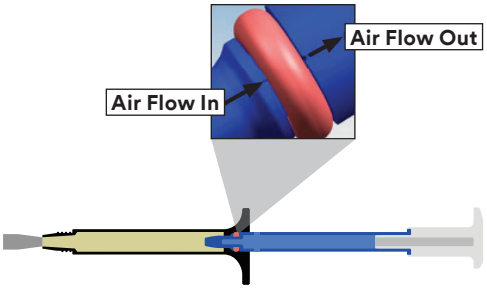
One of the product development goals was to reduce the amount of TEGDMA, a low molecular weight, high shrinkage monomer. Due to its low viscosity, TEGDMA is often used to lower the viscosity of high viscosity resin blends. The team came up with a hydroxyl-group free BisGMA called Procrylat. This monomer offers a high molecular weight and a low viscosity due to the lack of hydroxyl groups. This allows for a reduction in the amount of the high shrinkage TEGDMA without increasing the resin viscosity. A high filler load with excellent flow properties with mainly larger, lower shrinkage monomers has been achieved.

The resin is well balanced between hydrophilicity and hydrophobicity. The hydrophilic BisGMA and TEGDMA enable a good wetting of the more hydrophilic adhesive surface which is important for a good adaptation. On the other hand, the hydrophobic nature of Procrylat is regarded as advantageous for long term stability of the cured material. This can be seen with the high flexural fatigue limit of Filtek Supreme Flowable, which is still comparable to or better than some widely used Universal composites (IADR publication: Flexural Fatigue Limit of Aged Composite Specimens, Dede et al, Madrid 2019).

Delivery

Virtually No Bubbles or Run-on

3M™ Filtek™ Supreme Flowable Restorative Syringe was designed to have virtually no bubbles or material "run-on" during dispensing for better control thanks to the inner design which works in two ways:

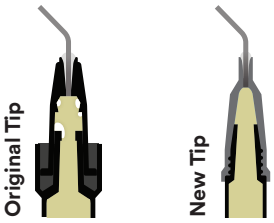


1 Air Entrapment Reduction System: Syringe Design

Due to a specially designed channel in the piston, air can escape from the syringe during the filling process at 3M production facilities. This prevents air from becoming trapped in the syringe, which can lead to bubbles and run-on.

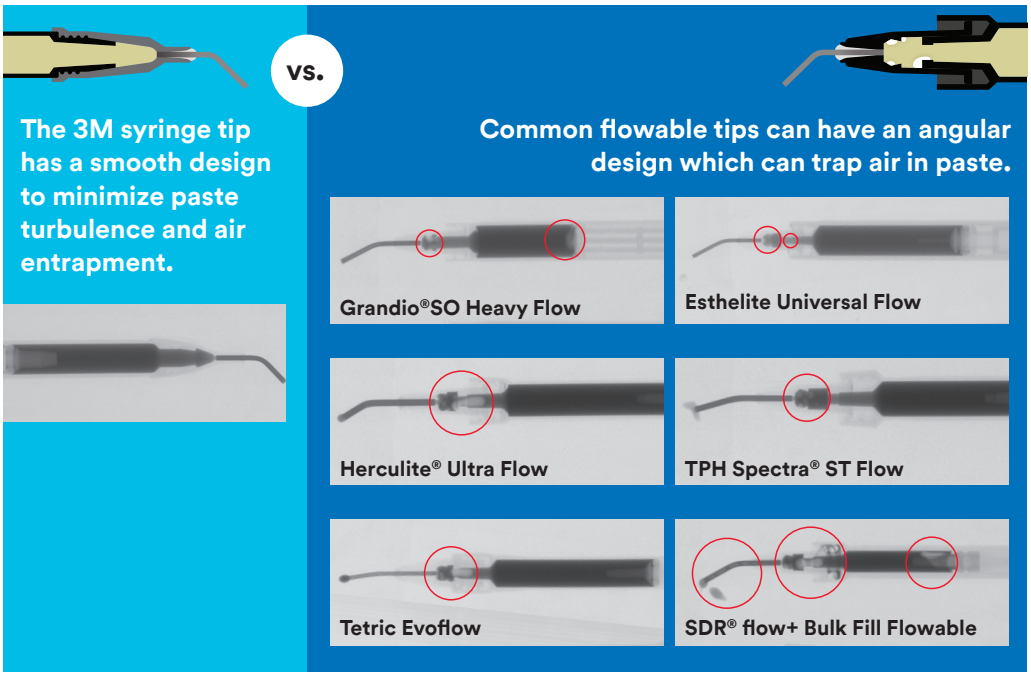
2 Air Entrapment Reduction System: Tip Design

Due to the smooth, tapered, inner-wall of the tip, which corresponds to the tapered angle of the syringe, material is able to flow through the new tip design without trapping air.



Comparison to competitor syringes

Bubbles can be introduced while dispensing flowable composites. Filtek Supreme Flowable Restorative Syringe was designed to avoid this due to a smooth design to minimize paste turbulence and air entrapment.



Source: 3M internal data. Grandio®SO Heavy Flow Lot # 1846460; TPH Spectra® Flow Lot # 1910000745; Estelite Universal Flow Lot # 012E99; Tetric Evoflow Lot # Y39462; Herculite™ Ultra Flow Lot # 7331880; SDR® flow + Bulk Fill Flowable Lot # 1603291; 3M™ Filtek™ Supreme Flowable Restorative Lot # NA63058.

Ergonomic Design

Easy to hold and inject

A triangular finger plate and plunger make it quick and easy to personalize your grip. The “No Roll” design with triangular finger plate ensures the syringe stays where placed on a flat surface.

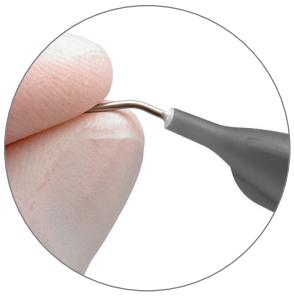
Reduced hand pressure offers increased comfort

With the increased surface area of the plunger, the required force to extrude the paste on the hand/thumb can be reduced up to 58%.[1]

Bendable Cannula

Easy-to-bend without kinking for better access

Designed to improve access to hard to reach preparations with an easy-to-bend cannula allowing for precise material placement. Then bend, the tip resists kinking, and the material can still be dispensed.



Material Volume Indicator

No more guessing

The blue syringe barrel indicates the remaining material volume. When your syringe is empty, only the white plunger shows. The inner cannula design is 20 gauge and can be exchanged with the 3M™ Filtek™ Bulk Fill Flowable Tips (19 gauge).[2]

1 Source: 3M internal data
2 Resulting in slightly higher extrusion force due to its smaller inner diameter.

Material Properties

Shades/Shade Match

3M™ Filtek™ Supreme Flowable Restorative shades match the VITAPAN® Classical Shade Guide and correspond to shades of 3M™ Filtek™ Supreme Ultra Universal Restorative and 3M™ Filtek™ Universal Restorative. The opacity of the shades corresponds to the Body shade opacity, except for the Opaque shade which has the opacity of the Dentin shades in Filtek Supreme Ultra Universal Restorative.

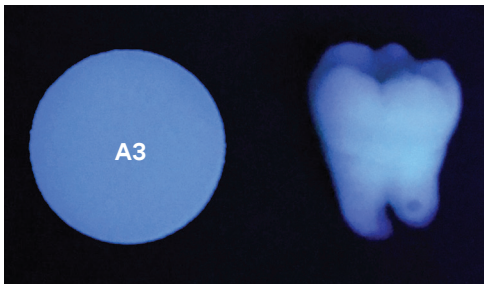
- A1, A2, A3, A3.5, A4, Opaque A3
- B1, B2, B3,
- D2,
- Extra White, White

3M™ Filtek™ Supreme Flowable Restorative | **3M™ Filtek™ Universal Restorative** | **3M™ Filtek™ Supreme Ultra Universal Restorative**

Fluorescence

One additional esthetic property of natural dentition is fluorescence.

It is thought that this property contributes to the vitality and lifelike appearance of dentition. Fluorescence in teeth occurs when light energy is absorbed and emitted at a longer wavelength, giving the tooth structure a blue-white appearance. Filtek Supreme Flowable Restorative has fluorescent pigments added to help match natural dentition.

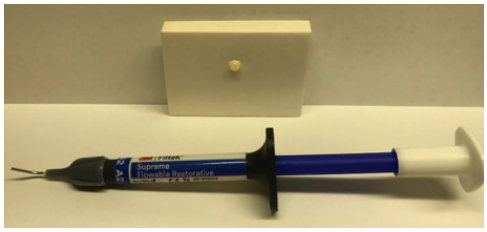


Fluorescence determined with light sources simulating natural UV light.

Source: 3M internal data.

Flow on Demand

When subjected to shear forces during dispensing, the viscosity of Filtek Supreme Flowable Restorative decreases lowering the extrusion force. The addition of a dimethacrylate polymer modifies the rheology of Filtek Supreme Flowable Restorative so it doesn't run when subjected to gravitational forces.



Flowable composite stays as placed on the mixing pad.

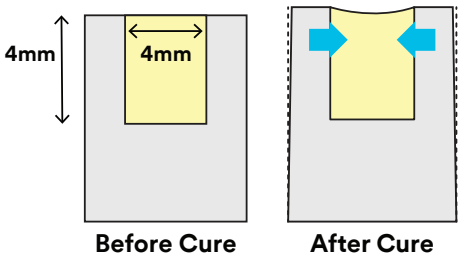
Technical Data

Property	Unit of Measure	Flowable Composite Average*	3M™ Filtek™ Supreme Flowable Restorative
Cusp Deflection	µm	13.4	13.3
Fracture Toughness	MPa $m^{1/2}$	1.5	1.4
Polish Retention	Gloss%	43.1	66
Radiopacity	mmAl	2.8	2.1

3M internal data.
*Ivoclar Tetric EvoFlow®, Dentsply TPH Spectra® Flow, Kuraray Clearfil Majesty™ Flow, Voco Grandio®SO Heavy Flow, GC G-aenial™ Universal Flo, GC G-aenial™ Universal Injectable.

Test Methods

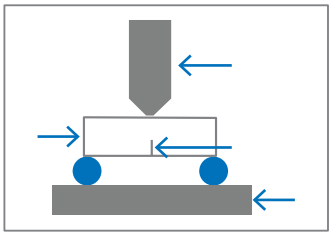
Cusp Deflection (shrinkage-stress) test method



Shrinkage can cause stress in the tooth, in the bonding layer and within the composite. Stress can be a result of the combination of shrinkage and modulus. For materials with similar shrinkage, the material with the higher modulus (or stiffness) usually will produce greater stress. Conversely, for materials with similar moduli, the material that exhibits the highest shrinkage will usually produce greater stress. Cusp deflection is a test method that was designed to provide a relative estimate of polymerization shrinkage stress resulting from placing and curing a dental composite in a 4 x 4mm, open-ended cavity. The cavity dimension roughly simulates a large cavity preparation (e.g., mesial-occlusal-distal (MOD) preparation). The surface of the aluminum cavity was sandblasted and silane-treated, and a dental adhesive was applied. The composite was then placed in the aluminum cavity in 2 separately cured increments of 2mm. A linear variable displacement transducer was used to measure the displacement of the aluminum cavity wall due to polymerization shrinkage stress. Aluminum was selected as the block material because it has a modulus similar to human enamel. A similar cusp deflection method using an aluminum block has been described in the literature.[1]

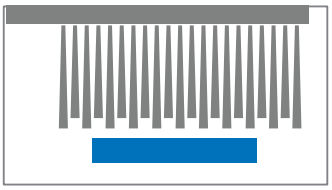
1. C. Thalacker et al., CED-IADR 2007, #0289.

Fracture Toughness (strength)



The values reported for fracture toughness are related to the energy required to propagate a crack. In this test, a short bar of material is cured. A notch is cut into it. The bar is placed on a fixture that supports either end, and an anvil is positioned above the notch. The anvil presses down until the bar breaks. Higher values mean the material is more resistant to fracturing and have been correlated with better resistance to fracture in clinical use.[2]

Polish Retention (abrasion resistance)



When any composite material undergoes abrasion (toothbrushing, chewing, etc.), the resin around the particles is worn. During this wear, the protruding filler particles (bumps) are exposed. Eventually after enough wear and time, the entire filler particle falls away from the surface of the composite, resulting in divots within the material's surface. When a material contains many of these bumps and craters, it creates an uneven, rough surface, which results in the loss of reflectivity (loss of gloss) on the composite surface.

Composite materials were shaped into tiles and thoroughly cured. The surfaces were polished wet using a Buehler variable-speed grinder-polisher to remove the air-inhibited layer and to ensure a uniform surface. They were stored in water at 37°C (98.6°F) for 24 hours. Gloss was measured at 60 degrees. The samples were brushed with toothpaste and a toothbrush that was mounted on an Automatic Toothbrush Machine. Gloss measurements were taken after every 1,500 cycles until the completion of 6,000 toothbrush strokes.

Curing Protocol

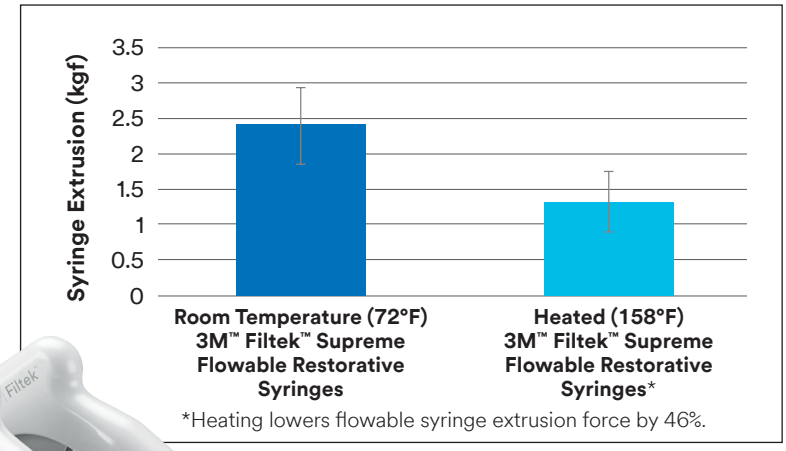
3M™ Filtek™ Supreme Flowable Restorative	Increment Depth	All halogen lights (with output 550 – 1000 mW/cm²)	3M™ Elipar™ LED Lights (with output 1000 – 2000 mW/cm²)
Opaque A3 Shade	1.5mm	40 sec.	20 sec.
All other Shades	2.0mm	20 sec.	10 sec.

2. N. Ilie, T. J. Hilton, S. D. Heintze, R. Hickel, D. C. Watts, N. Silikas, J. W. Stansbury, M. Cadenaro, and J. L. Ferracane. Academy of Dental Materials guidance—Resin composites: Part I—Mechanical properties. Dental Materials 33 (8):880–894, 2017.

Warming

Reasons to warm

- Warmed composites are more fluid, for easier handling
- Warming may improve adaptation of 3M composite to tooth structure[1]
- Warming lowers extrusion force[2]



*Heating lowers flowable syringe extrusion force by 46%.

The science of safety

3M has performed rigorous testing to ensure the safety of pre-warmed 3M™ Filtek™ Supreme Flowable Restorative for both clinicians and patients. Toxicology testing has been completed for all recommended 3M products. Extensive literature search and 3M pulp temperature testing confirm minimal heat transfer to the pulp.

3M is the first to offer a dental composite cleared by the FDA for warming.[3]

Biocompatible according to ISO-10992-1:2018 based on a review by a board-certified toxicologist.

Minimal heat transfer to the pulp.[2,5]

Unchanged physical properties[4]

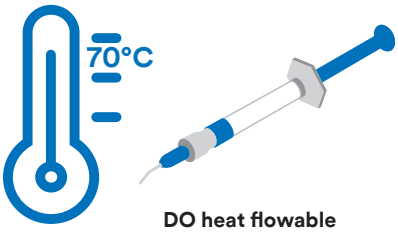
- Diametral tensile strength
- Flexural strength
- Depth of cure
- Flexural modulus
- Color stability

1. Based on a 3M sponsored in vitro study. 11 dentists placed 88 Class II MOD restorations. Teeth were microscopically exampled for flaws, defects and voids. Comparisons made between techniques and operators.
2. When warmed according to our IFU (up to 70°C or 158°F for up to 1 hour).
3. 3M™ Filtek™ Universal Restorative capsule.
4. 3M Internal Data.
5. Daronch M, Rueggeberg FA, De Goes MF, Giudici R. Polymerization kinetics of pre-heated composite. J Dent Res. 2006 Jan;85(1):38–43.

Tips for Success

You can safely warm 3M™ Filtek™ Supreme Flowable Restoratives in as little as 5 minutes! Follow these general guidelines and refer to the instructions for use for more information.

DO

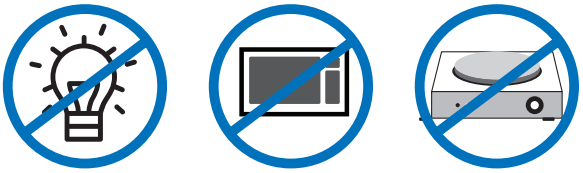


DO heat flowable syringes to up 70°C (158°F) for up to 1 hour, up to 25 times.

DO remove your composite from the heater after 5 minutes if it won't be used immediately.

DO consult the Instruction for Use for more information.

DON'T



Do NOT use heat from a light bulb, microwave, mug warmer or other unapproved heating devices. Only approved devices have been tested for safety and efficacy when warming select Filtek composites. Consult the Instructions for Use for more information.

Clinical Cases

Repair of Marginal Enamel Chipping

About the Case

A ten-year-old patient chipped his right central incisor while playing with the family cat. The case was treated during an emergency visit.

Challenge

When a child is involved, and only a small repair is needed, it is important to have a restorative delivery system that is fast, easy to use, and dispenses a controlled volume of material.

While flowable composites provide many desirable features, **the materials themselves often contain air bubbles**. If these bubbles go undetected, and the composite is cured, **a time-consuming repair may be needed** to achieve an esthetic and color stable final restoration.

Outcome

In a 10-minute procedure it was possible to **esthetically integrate the 3M™ Filtek™ Supreme Flowable Restorative** into the patient's natural tooth structure making this an effective and efficient treatment option.

Stabilizing Complex Cases with Single Shade Composites

About the Case

The patient was unhappy with the results of previous orthodontic and restorative treatments and expressed a desire for a more aesthetic outcome. A diagnostic and aesthetic assessment were the first stages in the treatment of this complex case.

Challenge

In my experience, small defects are more easily corrected with flowable composite (in this case 3M™ Filtek™ Supreme Flowable Restorative, Shade A2, which was followed by 3M™ Filtek™ Universal Restorative, Shade A2.

Outcome

The single shade composite strategy using the identical shade match of 3M™ Filtek™ Supreme Flowable Restorative followed immediately by 3M™ Filtek™ Universal Restorative allowed me **to focus on anatomical shape and finishing and polishing details** resulting in a very aesthetic final restoration.

Class V Restoration Esthetics

Before

3M™ Filtek™ Supreme Flowable Restorative offers a smooth transition from material to tooth for esthetic restorations.

After

Photos courtesy of Dr. Gunnar Reich, Munich, Germany.

Liner Application

3M™ Filtek™ Supreme Flowable Restorative, Shade A3, used as a liner for easy adaptation and marginal seal.

Dentin replaced with 3M™ Filtek™ Supreme Ultra Universal Restorative, Shade A3, and light cured. Enamel replaced with 3M™ Filtek™ Supreme Ultra Universal Restorative, shade A3, and light cured. Stain applied to fissures.

Outcome

3M™ Filtek™ Supreme Flowable Restorative adapts easily and seals the margin.

Photos courtesy of Dr. Giuseppe Chiodera, Brescia, Italy.

Warranty

3M warrants this product will be free from defects in material and manufacture at the time of purchase. 3M MAKES NO OTHER WARRANTIES INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. User is responsible for determining the suitability of the product for user's application. If this product is defective within the warranty period, your exclusive remedy and 3M's sole obligation shall be repair or replacement of the 3M product.

Limitation of Liability

Except where prohibited by law, 3M will not be liable for any loss or damage arising from this product, whether direct, indirect, special, incidental or consequential, regardless of the theory asserted, including warranty, contract, negligence or strict liability.

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