

**3M** Science.  
Applied to Life.™



3M™ Glass Bubbles  
For Automotive Applications

Lightweighting  
reimagined.

### Potential applications








- 4 Injection molded thermoplastics
- 5 Sheet/bulk molding composites (SMC/BMC)
- 6 Seam sealants and underbody coatings
- 7 Emerging applications in 5G & Electrical Connectors

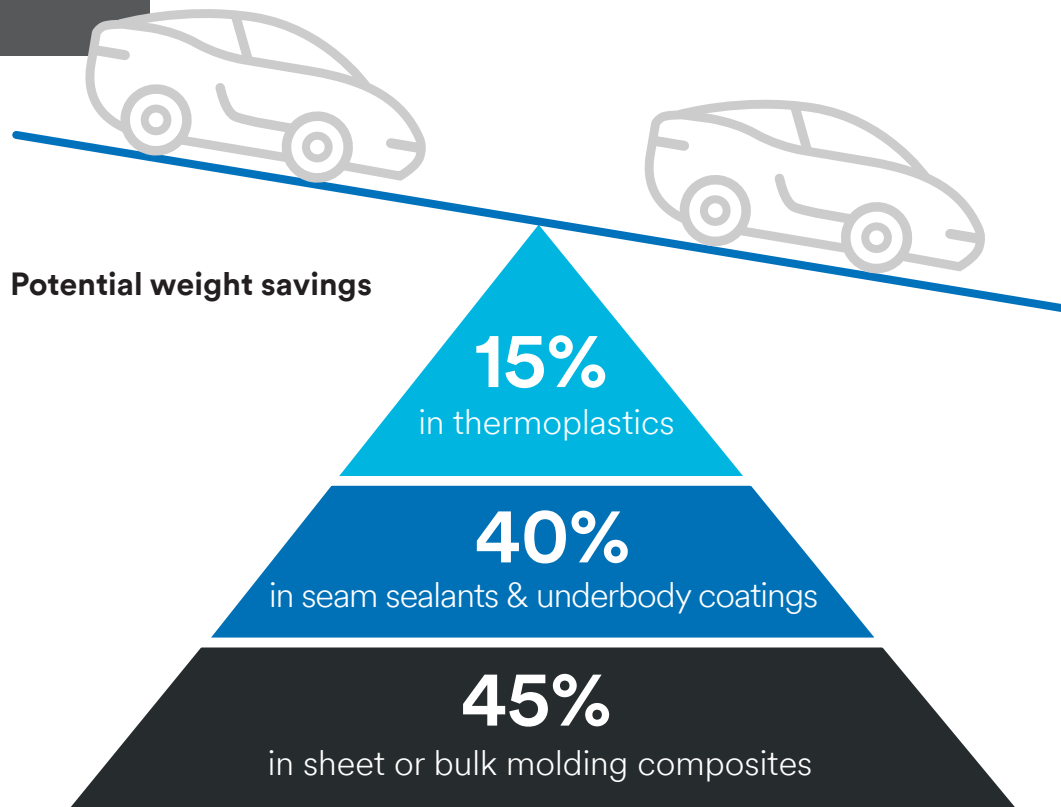
## Lower weight. Higher performance.

In the transportation industry, reducing weight is an important design requirement. That's why more and more suppliers of components used in vehicle manufacturing are taking advantage of the lightweighting and performance enhancing capabilities of 3M™ Glass Bubbles.

These high-strength, low-density hollow glass microspheres enable weight reductions in many automotive applications – including injection molded plastics, composites, SMCs/BMCs, plastisols and more. 3M Glass Bubbles can improve dimensional stability; electrical insulation; thermal conductivity; and the ability to deliver a Class A surface finish. 3M Glass Bubbles also deliver during production. They can help you reduce cost by displacing costly resins. Unlike irregularly shaped mineral fillers, they help you reduce equipment wear when plastisols are applied to the vehicle.

### Benefits 3M Glass Bubbles can bring to OEM Engineers & Material processors include:

-  Lightweighting and sustainability
-  Dimensional stability improvement
-  Thermal management
-  Cycle time reduction
-  Dielectric property improvement
-  Aesthetic Class A surface finish
-  Reduced resin costs



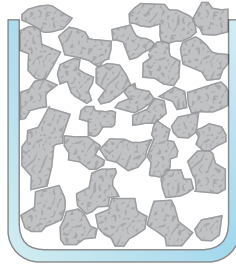
The use of 3M Glass Bubble-filled plastics can shed pounds or kilograms per vehicle, to help OEMs achieve fuel economy and emissions reduction targets.

# The science of the spheres

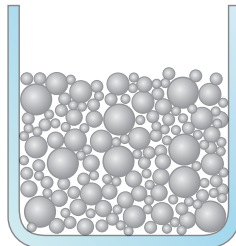
3M™ Glass Bubbles are finely dispersed, free-flowing powders consisting of thin-walled hollow glass microspheres. Made of soda-lime-borosilicate glass, 3M Glass Bubbles are chemically inert, nonflammable and water resistant.

- High strength-to-density ratio
- Free-flowing nature provides low viscosity build
- High filler loading reduces resin demand and helps you lower raw material cost

Because spheres have the lowest surface area to volume ratio of any shape, 3M Glass Bubbles pack tightly for high filler loading.



**Irregular shaped fillers**



**Spherical shaped 3M Glass Bubbles**

Property	3M™ Glass Bubbles
<b>Shape</b>	Hollow spheres with thin walls
<b>Composition</b>	Soda-lime-borosilicate glass
<b>Color, unaided eye</b>	Off-white, powdery
<b>Crush strength*</b>	250–28,000 psi 17–1,930 bar 1.7–193 MPa
<b>True density**</b>	0.125–0.60 g/cc
<b>Median particle size</b>	18–65 microns
<b>Softening temperature</b>	600°C (1112°F)
<b>Thermal conductivity (@20°C)</b>	0.05–0.20 W/(m*K)
<b>Dielectric constant (@100 MHz)</b>	1.2–1.9

\*3M internal QCM

\*\*Helium Gas Pycnometer

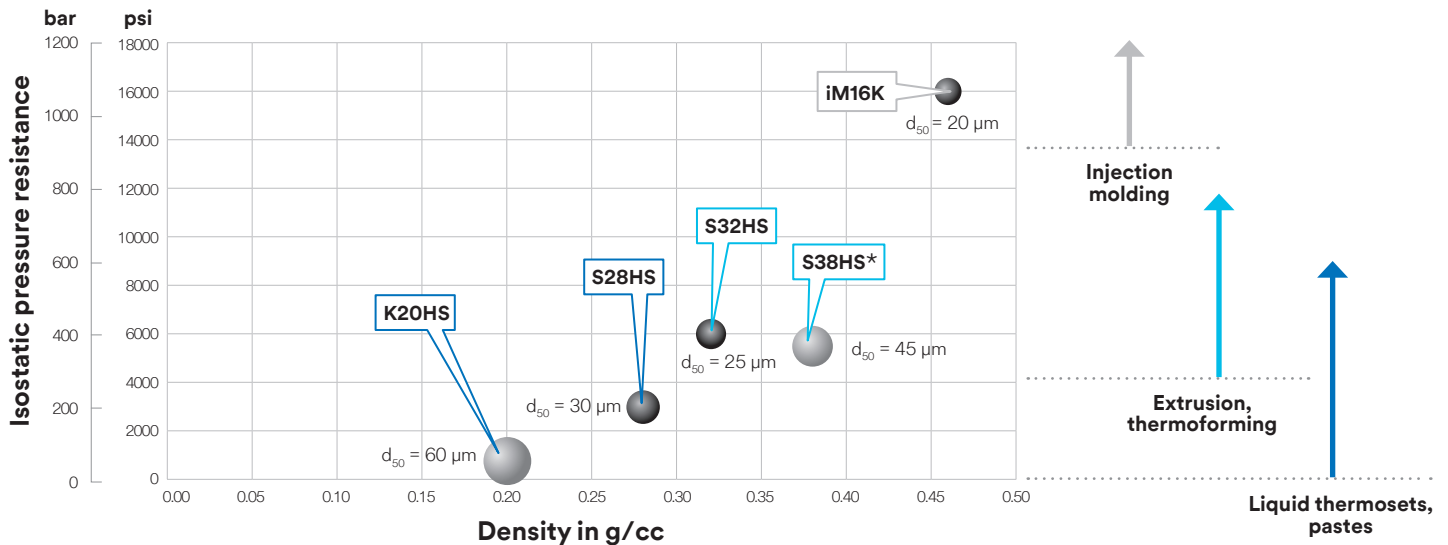
The above values refer to different grades of the product portfolio offering.

## Lightweighting in more places than ever

3M Glass Bubbles are offered in a range of high performance grades. So instead of metal or heavy PVC-based underbody coatings, lightweight parts and coatings can now be used in many more areas of the automobile. 3M Glass Bubbles are used in SMCs/BMCs, thermoplastics, sealants and structural foams as well as LFT, RIM, RRIM and lightweight body fillers.

### Isostatic pressure resistance vs. density

The bubble size represents the average particle size (d<sub>50</sub>)



\*Measured at 80% survivability. All others at 90%.

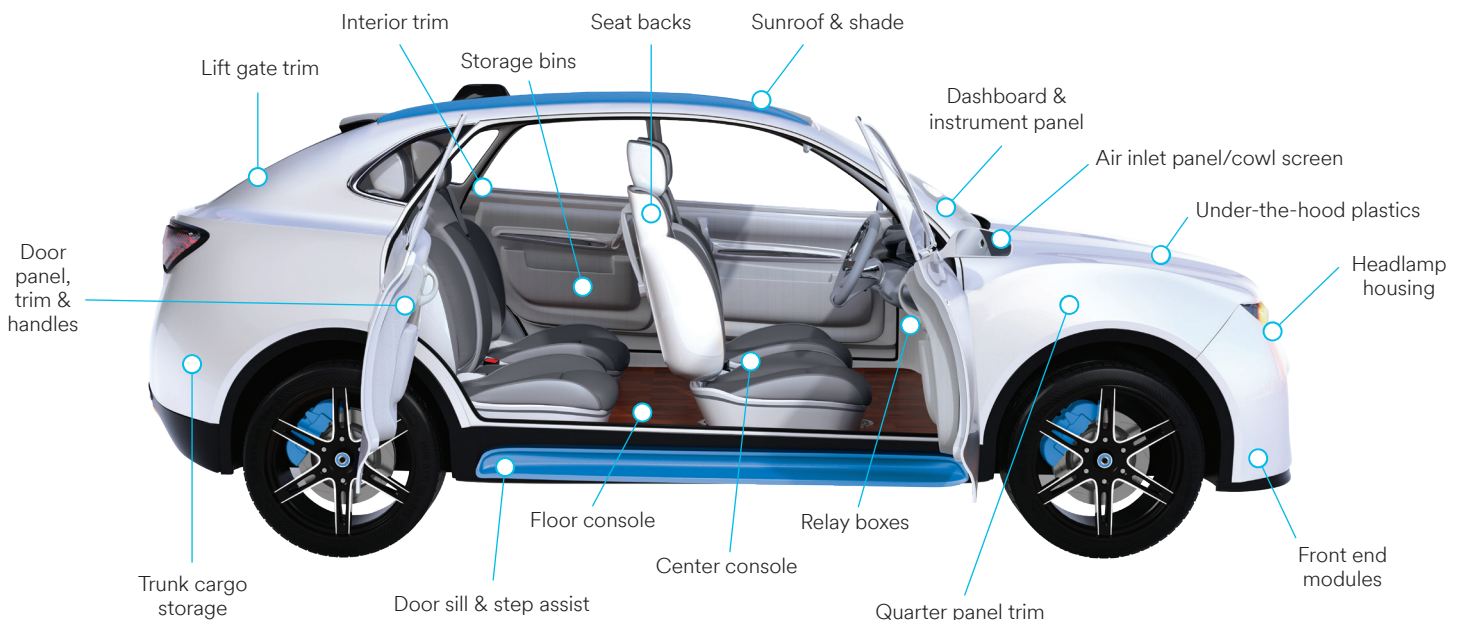
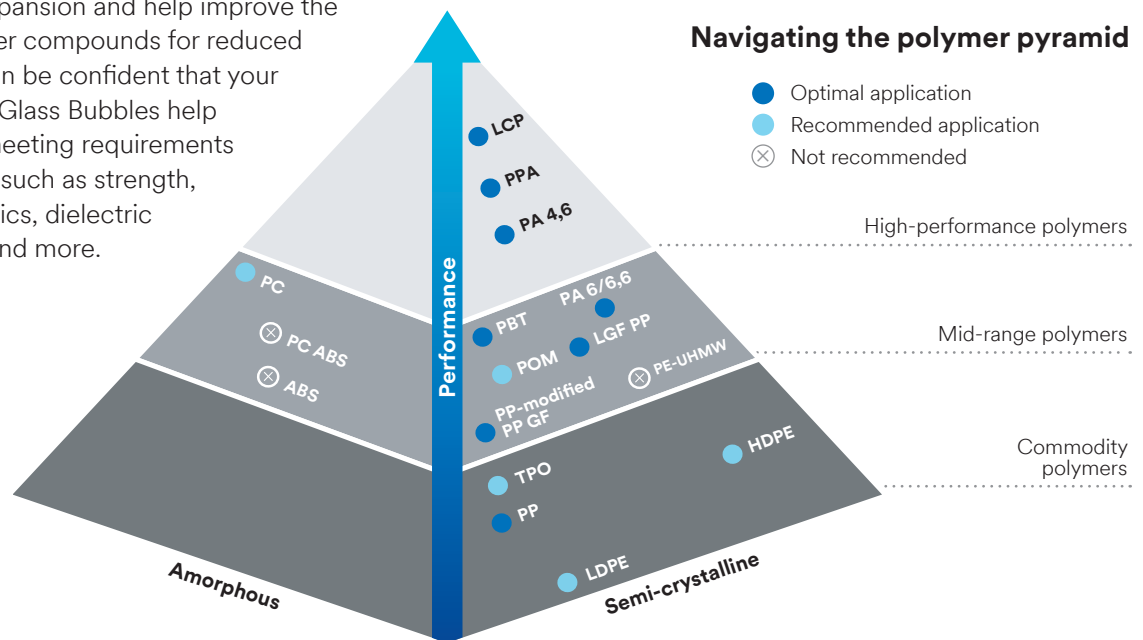


## Injection molded thermoplastics

3M is one of the only known manufacturers to offer high-strength, low-density hollow glass microspheres that can withstand harsh compounding and injection molding processes. Take 3M™ Glass Bubbles iM16K for example: this grade features a compressive strength of 16,000 psi (1,100 bar) at a density of just 0.46 g/cc and a particle size of 20 µm (diameter D50).

That's just the start. Compared to conventional fillers used in PP, PA, PC/ABS and other thermoplastics, 3M Glass Bubbles allow more flexibility for producing light, dimensionally accurate parts. They enable lower linear thermal expansion and help improve the dimensional stability of polymer compounds for reduced shrinkage and warping. You can be confident that your thermoplastic parts using 3M Glass Bubbles help reduce vehicle weight while meeting requirements for a wide range of properties such as strength, process requirements, aesthetics, dielectric performance, lightweighting and more.

**TIP:** 3M™ Glass Bubbles lead to greater weight reduction when replacing high-density fillers. When reducing density by displacing resin, they provide a better benefit when used in higher-performing, higher-cost polymers.



## Sheet molding and bulk composites

A typical automobile has about 300 kg (661 lbs) of composite parts. That's a lot of weight, especially when electric and high efficiency vehicles are becoming more popular. The solution: integrating 3M™ Glass Bubbles. Now, ultralightweight sheet molding and bulk molding composites that contain 3M Glass Bubbles can withstand the compression or injection molding process despite their low density.

Ultralightweight SMC/BMC parts can be up to 45% lighter vs. standard composites – with no reduction in dimensional stability. They can even be more cost effective than aluminum or steel. Best of all, 3M Glass Bubbles can enable Class A paintable surface finishes. So SMCs and BMCs are now suitable for parts such as hoods, trunk lids, body panels, battery enclosures and more.

### Emerging Application: SMC Battery Enclosures

To reduce weight of heavy battery packs in electric vehicles, composite materials, like SMC, are being used as the enclosure or cover in place of steel or aluminum. This opens up new opportunities for lightweighting with 3M Glass Bubbles.

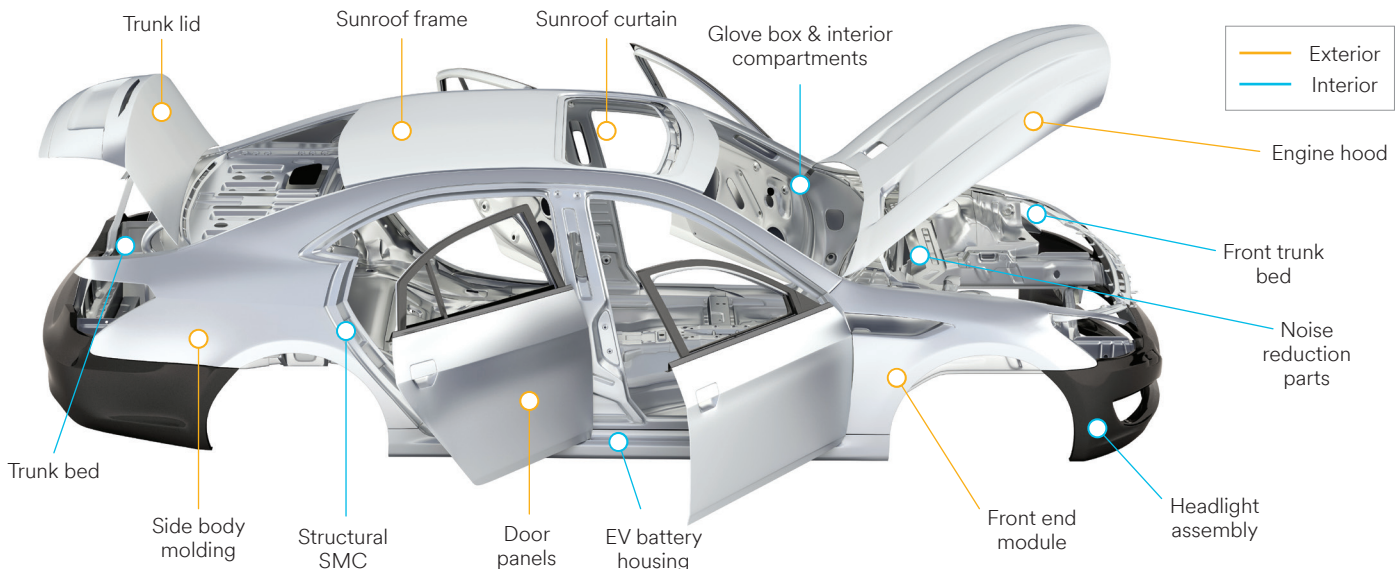
### Advantages 3M Glass Bubbles may help you achieve:

- Reduce weight by up to 45%
- Enable Class A paintable surface finish



### Taking weight reduction to the next level

With the addition of our newest grades of 3M Glass Bubbles, molders, compounders and automotive OEM manufacturers now have more options to tailor the composite weight for specific requirements – down to **less than 1.0 g/cc**. That's equivalent to a weight saving of up to **45%!**

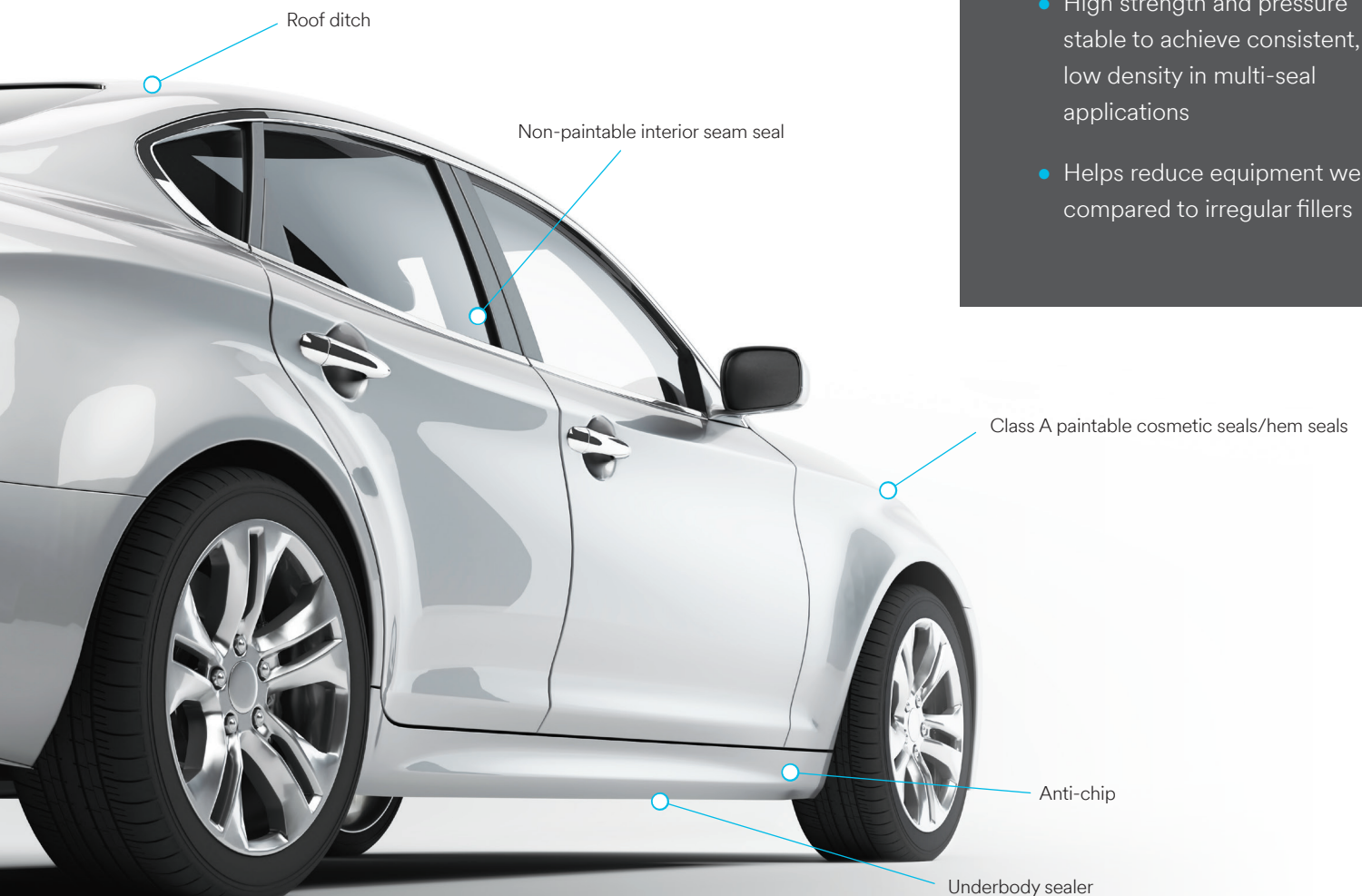


## Sealants and underbody coatings

Developed specifically for plastisol production today and tomorrow, 3M™ Glass Bubbles can reduce the weight of plastisols used in seam sealants and underbody coatings by up to 40% – even higher if the coatings are applied using precision automated equipment. This contributes to lower overall vehicle weight, helps OEMs and automotive designers meet increasingly-stringent industry and government standards and helps them improve battery range and life in electric and hybrid vehicles. Best of all, 3M Glass Bubbles can enable durable, lightweight coatings with a Class A paintable finish.

### Advantages 3M Glass Bubbles may help you achieve:

- Reduces plastisol weight up to 40%
- Allows increased volume loading while maintaining desired viscosity
- Low aspect ratio enables faster wettability and dispersion
- Produces surfaces that are easily skived (trimmed to desired thickness)
- Can reduce sag on vertical applications
- High strength and pressure stable to achieve consistent, low density in multi-seal applications
- Helps reduce equipment wear compared to irregular fillers





## 5G connected electronics

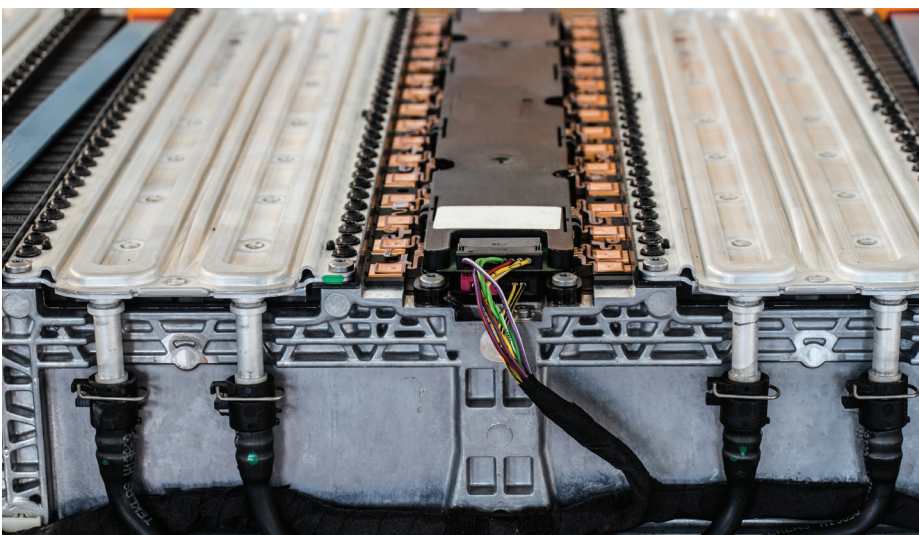


More and more, our vehicles are connected, increasing the number of signals sent and received. Low-loss plastics and composite materials can help you optimize the signal. 3M™ Glass Bubbles deliver excellent dielectric properties in a variety of resin systems and applications, enabling a higher signal transfer in 5G Components.

### Advantages 3M Glass Bubbles may help you achieve:

- Improved dielectric properties
- Improved sensor performance
- Enhanced signal strength
- Weight reduction
- Thermal management

## Battery potting resins



3M Glass Bubbles are an easy way to bring thermal insulation properties to battery thermal management solutions and can help cut resin costs, all while reducing part weight by 15% to 40%. Used in battery potting resins, their low viscosity build is excellent for consistent fills even at high loadings.

### Advantages 3M Glass Bubbles may help you achieve:

- Formulate for excellent thermal management components in EV battery applications
- Fill small crevices even at high loadings for potting resins around cylindrical EV battery cells
- Weight reduction

# Global support for your business

When you work with 3M, you'll have access to new and unique materials solutions, knowledgeable technical and applications support, and a reliable global supply chain. 3M™ Glass Bubbles are supported by global sales, technical and customer service resources, with fully-staffed technical service laboratories in the U.S., Europe, Japan, Latin America and Southeast Asia.

For more information, including formulation assistance, optimization of material handling or questions about a specific application, contact your 3M technical representative. Users benefit from 3M's broad technology base and continuing attention to product development, performance, safety and environmental issues.

**Visit us online to download technical papers, read application profiles, watch videos and more!**

**3M.com/AutoGlassBubbles**

## We've got technical service down to a science.

3M wants to help you succeed in leveraging 3M Glass Bubbles in automotive applications. Our application engineers are available to consult at every step in the automotive value chain to help optimize your process.

### We offer:

- Application consultation and product grade selection
- Formulation assistance
- Processing and handling optimization

### Customer Service

**Central Europe Region:**  
**3M D-A-CH (Germany, Austria Switzerland)**  
Advanced Materials Division  
Phone: +49 2131 8819 185  
E-Mail: [specialmarkets@mmm.com](mailto:specialmarkets@mmm.com)  
Further Information, visit our German website [www.3M.de/Glassbubbles](http://www.3M.de/Glassbubbles)  
Carl-Schurz-Straße  
41453 Neuss  
Germany

**West Med Region:**  
**3M Advanced Materials Division**  
**West Mediterranean Region**  
3M en France, 1 Parvis de l'Innovation  
CS 20203  
95006 Cergy-Pontoise cedex

**France**  
Phone +33 1 76 39 01 50  
**Spain**  
Phone +34 919 01 81 77  
**Portugal**  
Phone +351 210 200 444

**South East Europe Region:**  
**3M Advanced Materials Division**  
**South East Europe Region**  
3M Italia Srl  
Via Norberto Bobbio, 21  
20096 Pioltello (Milano)

**Italy**  
Phone +39 2 70351  
**Turkey**  
Phone +90 216 538 07 77  
**Greece**  
Phone +30-2106885300  
**Romania**  
Phone +40-212028000

**USA**  
**3M Advanced Materials Division**  
3M Center  
St. Paul, MN 55144-1000  
United States  
Phone: 1 800 367 8905

**Latin America**  
**3M Brasil**  
Via Anhanguera km  
110 Sumare  
Sao Paulo CEP 13181-900  
Brasil  
Phone: 0800 0132333  
[falecoma3m@mmm.com](mailto:falecoma3m@mmm.com)

**3M Mexico**  
Santa Fe 190, Col. Santa Fe  
Deleg. Alvaro Obregon  
Mexico D.F., C.P. 01210  
México  
Phone: 800 120 3636  
[materialesavanzados@mmm.com](mailto:materialesavanzados@mmm.com)

**Asia**  
**3M Japan**  
6-7-29, Kita-Shinagawa  
Shinagawa-ku  
Tokyo 141-8684  
Japan  
Phone: 81 570 022 123  
[3mcompany.jp/autoglassbubbles](http://3mcompany.jp/autoglassbubbles)

**3M Korea**  
18F, 82, Uisadang-daero  
Yeongdeungpo-gu, Seoul, 150-705  
Korea  
Phone: 82 80 033 4114  
[www.3M.co.kr/glassbubbles](http://www.3M.co.kr/glassbubbles)

**3M Thailand**  
14th Floor  
The PARQ Building  
88 Ratchadaphisek Road  
Klong Toei, Bangkok  
Thailand  
Phone: 66 0 2666 3666

**3M India**  
N0.48-51  
Electronic city  
Hosur Road  
Bangalore Karnataka-560100  
India  
Phone: 91 1800 425 3030

**Warranty, Limited Remedy, and Disclaimer:** Many factors beyond 3M's control and uniquely within user's knowledge and control can affect the use and performance of a 3M product in a particular application. User is solely responsible for evaluating the 3M product and determining whether it is fit for a particular purpose and suitable for user's method of application. User is solely responsible for evaluating third party intellectual property rights and for ensuring that user's use of 3M product does not violate any third party intellectual property rights. Unless a different warranty is specifically stated in the applicable product literature or packaging insert, 3M warrants that each 3M product meets the applicable 3M product specification at the time 3M ships the product. **3M MAKES NO OTHER WARRANTIES OR CONDITIONS, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, ANY IMPLIED WARRANTY OR CONDITION OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR ANY IMPLIED WARRANTY OF NON-INFRINGEMENT OR ANY IMPLIED WARRANTY OR CONDITION ARISING OUT OF A COURSE OF DEALING, CUSTOM OR USAGE OF TRADE.** If the 3M product does not conform to this warranty, then the sole and exclusive remedy is, at 3M's option, replacement of the 3M product or refund of the purchase price.

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

**Technical Information:** Technical information, recommendations, and other statements contained in this document or provided by 3M personnel are based on tests or experience that 3M believes are reliable, but the accuracy or completeness of such information is not guaranteed. Such information is intended for persons with knowledge and technical skills sufficient to assess and apply their own informed judgment to the information. No license under any 3M or third party intellectual property rights is granted or implied with this information.



### 3M Advanced Materials Division

3M Center  
St. Paul, MN 55144 USA

Phone 1-800-367-8905  
Web [www.3M.com/autoglassbubbles](http://www.3M.com/autoglassbubbles)

3M is a trademark of 3M Company.  
Used under license by 3M subsidiaries and affiliates.

© 3M 2022.  
All rights reserved. Issued: 3/22