3M™ Microspheres
Applications Guide

Innovative Solutions for Demanding Applications

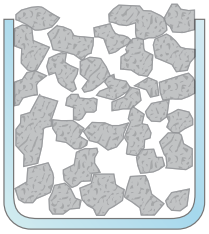
3M

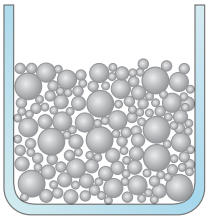
Spherical simplicity for complex problems

Global competition, escalating materials costs, higher customer expectations, environmental regulations – these and other factors can put serious pressure on your bottom line.

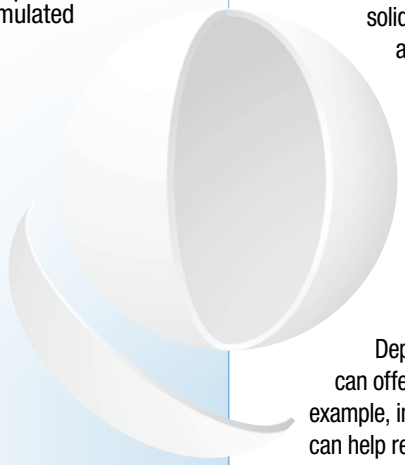
But now, with 3M microsphere technologies, you have a powerful resource to help solve or avoid many of the complex design, production and marketing challenges you face.

Derived from nature's simplest shape, 3M™ Microspheres are engineered to help you reduce costs, enhance properties and improve processability in a wide range of applications.





3M™ Glass Bubbles – hollow microspheres specially formulated for highest strength-to-weight ratio. Lightweight but with the strength to survive processing.



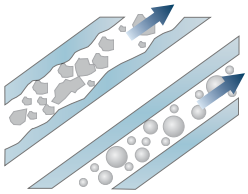
Higher filler loading

With the lowest surface area to volume ratio of any shape, 3M ceramic microspheres increase volume loading capacity. That can mean higher solids/reduced VOCs, reduced shrinkage, and reduced cost through lower resin demand in certain applications.

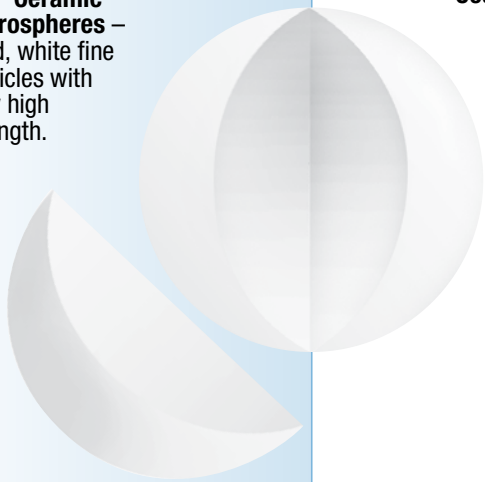
Lower viscosity and improved flow

Unlike irregularly shaped fillers, 3M glass bubbles roll easily over one another.

Depending on your application, this trait can offer a number of potential benefits. For example, in molded plastics, 3M glass bubbles can help reduce warpage.



3M™ Ceramic Microspheres – solid, white fine particles with very high strength.



Cost effective per unit volume

Lightweight 3M glass bubbles occupy more space than an equal weight of typical mineral filler. This means that, when you consider cost per unit volume instead of cost per pound, 3M glass bubbles can be a cost-effective choice in many applications – especially when you factor in the enhancements possible with 3M glass bubble technology.

Problem solving for many industries

3M microsphere technology offers solutions to a wide range of manufacturing challenges. For example, it can help reduce the dielectric constant in printed circuit boards. Enhance features in sporting goods. Optimize sensitization in emulsion explosives. Reduce cracking and shrinkage in spackling compound.

Here are just a few more of the many areas where 3M microspheres have demonstrated their usefulness:

- Building materials: caulks, adhesives, cultured marble, mastics, paints, preformed concrete, and roof coatings
- Deep sea pipe insulation, buoyancy modules and risers
- Lightweight plastics: injection molded thermoplastics, SMC, BMC, RIM, RTM, and pultrusion
- Aerospace and marine composites, potting compounds and radomes

Other application ideas range from oil field drilling fluids and cements to trailer liner panels; film anti-block to flotation devices, cryogenic insulation and autobody putty.

Surface treatment of glass bubbles available upon request.

Engineered for problem solving

NOTE: Technical information and data shown here should be considered representative or typical only and should not be used for specification purposes. Refer to product data pages for additional technical information.

* MCC – Methacrylato Chromic Chloride

**H50 strength per 3M QCM 90% survival minimum.

3M™ Glass Bubbles

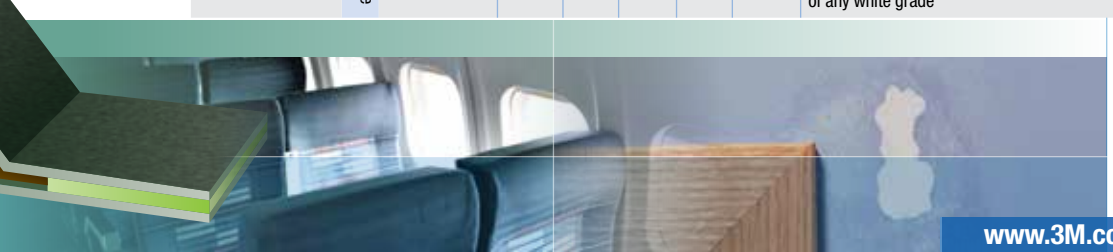
	Composition	Target Crush Strength (90% survival, psi)	True Density (g/cc)	Typical Particle Size (microns, by volume) Distribution 10th%	50th%	90th%	Color (unaided eye)	Comments	Application Ideas
K1	Soda-lime-borosilicate glass	250	0.125	30	65	115	white	Most economical 3M glass bubble	Bowling balls, cast polyester, cast synthetic foam, caulk, explosives, polyester putty, sealants, shallow water pipe insulation, potting compounds, tooling boards, spackling compound, and RTM.
K15		300	0.15	30	60	105	white		
S15		300	0.15	25	55	90	white	Smaller version of K15	
S22		400	0.22	20	35	65	white	Small particle size	
K20		500	0.20	25	55	95	white		
K25		750	0.25	25	55	90	white		
S32		2000	0.32	20	40	70	white		BMC, deep sea pipe insulation, buoyancy modules and risers, golf balls, RIM, SMC, pultrusion, sprayable PVC sealer, sprayable syntactic foam, spray-up/lay-up, thermoplastics and elastomers.
S35		3000	0.35	10	40	75	white		
K37		3000	0.37	20	45	80	white		
XLD3000		3000	0.23	15	30	40	white		
S38		4000	0.38	15	40	75	white		
S38HS		5500	0.38	15	40	75	white		
S38XHS		5500	0.38	15	40	70	white		
K46		6000	0.46	15	40	70	white		
K42HS		7500	0.42	11	22	37	white		
S60		10,000	0.60	15	30	55	white	For extrusion processing	
S60HS		18,000	0.60	11	30	50	white	For injection molding	
iM16K		16,000	0.46	12	20	30	white	For injection molding, extrusion processing	
iM30K		28,000	0.60	9	16	25	white	For injection molding, extrusion processing	

3M™ Glass Bubbles Floated Series

A16/500	Soda-lime-borosilicate glass	500	0.16	30	65	115	lt. green	MCC* surface treatment	Aerospace and hydrospace syntactic foams, potting compounds and radomes; and printed circuit boards.
G18		500	0.18	15	35	70	white		
A20/1000		1000	0.20	30	60	105	lt. green	MCC* surface treatment	
H20/1000		1000	0.20	25	55	90	white	Epoxy silane surface treatment	
D32/4500		4500	0.32	20	35	65	lt. green	MCC* surface treatment	
H50/10,000 EPX**		10,000	0.50	15	35	60	white	Epoxy silane surface treatment	

3M™ Ceramic Microspheres

W-210	Alkali alumino silicate ceramic	>60,000	2.4	N/A	N/A	13	white	Finest white product, least gloss reduction of any white grade	Light colored, thin film coating and anti-block for clear or white film. Burnish/stain resistant wall and house paints.
W-410		>60,000	2.4	N/A	N/A	23	white	6 Hegman grind	Burnish-resistant wall and house paints; most light colored industrial and maintenance paints.
W-610		>60,000	2.4	N/A	N/A	38	white	325 mesh, most gloss reduction of any white grade	Maintenance paints thicker than 2 mils, low gloss paints, adhesives and decorative flooring.



The Choice is Yours

3M™ Microspheres provide a wide choice of unique enhancements. Select from a range of microsphere characteristics (see chart on inside page) to help you meet your processing and end use requirements.

In automotive applications, 3M™ Glass Bubbles can help provide cost-effective weight reduction in sealers, adhesives and molded plastic parts, including SMC, BMC, RIM, and thermoplastics.

In high solids industrial coatings, 3M™ Ceramic Microspheres can help reduce VOCs, and help improve hardness, abrasion resistance and sprayability.

Potential Enhancements	Microsphere Considerations
Abrasion resistance	3M Ceramic Microspheres
Chemical stability	Any product listed in this brochure
Explosive sensitization	3M Glass Bubbles
Gloss control	3M Ceramic Microspheres
Hardness	3M Ceramic Microspheres
High filler loading	Any product listed in this brochure
Low viscosity	Any product listed in this brochure
Reduced dielectric constant	3M Glass Bubbles
Reduced warpage/shrinkage	Any product listed in this brochure
Sandability/machinability	3M Glass Bubbles
Temp resistance up to 2200°F	3M Ceramic Microspheres
Thermal insulation	3M Glass Bubbles
Water resistance	Any product listed in this brochure
Weight reduction	3M Glass Bubbles
Material compatibility	Surface treated 3M Glass Bubbles
Reduced resin demand	Any product listed in this brochure

Wide choice of unique enhancements

Resources

3M™ Microspheres are supported by global sales, technical and customer service resources, with fully-staffed technical service laboratories and an authorized distributor network in the U.S., Europe, Japan, Latin America and Southeast Asia. Users benefit from 3M's broad technology base and continuing attention to product development, performance, safety and environmental issues – including development of innovative solutions such as surface-treated and metal-coated products.

For additional technical information on 3M microspheres in the United States, call 3M Advanced Materials Division, 800-367-8905. For other 3M global offices, and information on additional 3M products, visit our website at: **www.3M.com/microspheres**.

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