



3M™

Microspheres

Innovative solutions for demanding applications



**3M** *Innovation*

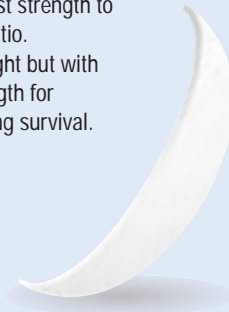
### 3M™ High Strength Ceramic Microspheres—

fine particles with very high strength.



### 3M™ Glass Bubbles —

specially formulated for highest strength to weight ratio. Lightweight but with the strength for processing survival.



*Engineered for a wide choice of unique enhancements*

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

## Spherical simplicity to help solve complex problems

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™ Hollow Ceramic Microspheres —

Low density, lower cost microspheres for utility applications.

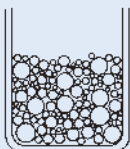


Series "G"

All 3M™ Zeeospheres™ Ceramic Microspheres, 3M™ Z-Light Spheres™ Ceramic Microspheres, and 3M™ Scotchlite™ Glass Bubbles are now being sold under the 3M brand name.

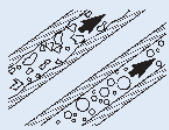
### Higher filler loading

With the lowest surface area to volume ratio of any shape, 3M 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 microspheres roll easily over one another.



Depending on your application, this trait can offer a number of potential benefits. For example, in molded plastics, 3M microspheres can help reduce warpage. Other potential enhancements are noted on the flap at right.

### Cost effective per unit volume

Lightweight 3M microspheres 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 microspheres can be a cost effective choice in many applications— especially when you factor in the enhancements possible with 3M microsphere technology.



	Composition	Target Crush Strength (90% survival, psi)	True Density (g/cc)	Particle Size (microns, by volume) Distribution				Color (unaided eye)
				10th%	50th%	90th%	Effective top size (95%)	
<b>3M™ Glass Bubbles General Purpose Series</b>								
K11	Soda-lime- borosilicate glass	200	0.11	30	65	110	120	white
K1		250	0.125	30	65	110	120	white
K15		300	0.15	30	60	105	115	white
S15		300	0.15	25	55	90	95	white
S22		400	0.22	20	35	60	75	white
K20		500	0.20	30	65	110	120	white
K25		750	0.25	25	55	95	105	white
S32		2,000	0.32	20	40	75	80	white
S35		3,000	0.35	18	40	75	85	white
K37		3,000	0.37	20	40	80	85	white
S38		4,000	0.38	15	40	75	85	white
S38HS		5,500	0.38	15	40	75	85	white
K46		6,000	0.46	15	40	70	80	white
S60		10,000	0.60	15	30	55	65	white
S60HS		18,000	0.60	11	30	50	60	white
<b>3M™ Glass Bubbles Floated Series</b>								
A16/500	Soda-lime- borosilicate glass	500	0.16	35	70	115	135	white
A20/1000		1,000	0.20	30	60	100	120	white
H20/1000		1,000	0.20	30	60	100	120	white
D32/4500		4,500	0.32	20	40	70	85	white
H50/10,000 EPX		10,000	0.50	20	40	50	60	white
<b>3M™ Hollow Ceramic Microspheres</b>								
G-3125	Silica- alumina ceramic	2,000	0.7	50	95	120	125	gray
G-3150		2,000	0.7	55	105	135	145	gray
G-3500		2,000	0.7	65	130	200	225	gray
<b>3M™ High Strength Ceramic Microspheres</b>								
G-200	Silica- alumina ceramic	>60,000	2.5	1	4	9	12	gray
G-400		>60,000	2.4	1	5	14	24	gray
G-600		>60,000	2.3	1	6	24	40	gray
G-800		>60,000	2.2	2	18	75	200	gray
G-850		>60,000	2.1	12	40	100	200	gray
W-210		Alkali alumino silicate ceramic	>60,000	2.4	1	3	9	12
W-410	>60,000		2.4	1	4	15	24	white
W-610	>60,000		2.4	1	10	28	40	white

**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 literature for more information.



Reduced dielectric constant for printed circuit boards.

Variety of sporting goods enhancements.

Comments

Application Ideas

Problem solving for many industries

Lowest density glass bubble  
Most economical 3M glass bubble

Smaller version of K15  
Small particle size

For extrusion processing  
For injection molding

MCC\* surface treatment  
MCC\* surface treatment  
Epoxy silane surface treatment  
MCC\* surface treatment  
Epoxy silane surface treatment

Most economical 3M hollow ceramic microsphere

Finest standard product, least gloss reduction  
6 Hegman grind  
325 mesh  
Lowest cost/pound, broad distribution  
Fewer fines than G-800

Finest white product, least gloss reduction of any white grade  
6 Hegman grind

325 mesh, most gloss reduction of any white grade

Bowling balls, cast polyester, cast syntactic foam, caulk, explosives, polyester putty, sealants, shallow water pipe insulation, potting compounds, tooling boards, spackling compound, and RTM.

BMC, deep sea pipe insulation, golf balls, RIM, SMC, pultrusion, sprayable PVC sealer, sprayable syntactic foam, spray-up/lay-up, and thermoplastics.

Aerospace and hydrospace syntactic foams, potting compounds and radomes; and printed circuit boards.

Bowling balls, cultured marble, oil well cements, plywood patch, roof coatings, refractory materials, grinding wheels, lightweight cement, polymer concrete, exterior insulating finishes, and synthetic stucco.

Industrial paints, film anti-block, and powder coatings.  
Maintenance paints and adhesives.

Polymer concrete, textured coatings and epoxy grouts and flooring.

Light colored, thin film coating and anti-block for clear or white film.

Burnish-resistant wall and house paints; most light colored industrial and maintenance paints.

Maintenance paints thicker than 2 mils, low gloss paints, adhesives and decorative flooring.

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. Reduce weight in aircraft in syntactic foam. 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, and roof coatings.
- 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 casing cements to trailer liner panels; film anti-block to flotation devices and autobody putty.

duct data pages for additional technical information.

\* MCC – Methacrylate Chromic Chloride



Syntactic foam to help reduce aircraft weight.

Spackling compound that resists cracking.

## 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 specific processing and end use requirements.

### In high solids industrial coatings,

3M™ High Strength Ceramic Microspheres can help reduce VOCs, and help improve hardness, corrosion resistance, abrasion resistance, and sprayability.



Potential enhancement	Microsphere considerations
Abrasion resistance	High Strength Ceramic Microspheres
Chemical stability	Any microsphere in this brochure
Corrosion resistance	High Strength Ceramic Microspheres
Explosive sensitization	Glass Bubbles
Gloss control	High Strength Ceramic Microspheres
Hardness	High Strength Ceramic Microspheres
High filler loading	Any microsphere in this brochure
Low viscosity	Any microsphere in this brochure
Reduced dielectric constant	Glass Bubbles
Reduced warpage/shrinkage	Any microsphere in this brochure
Sandability/machinability	Glass Bubbles or Hollow Ceramic Microspheres
Temp resistance up to 2200°F	High Strength or Hollow Ceramic Microspheres
Thermal insulation	Glass Bubbles or Hollow Ceramic Microspheres
Water resistance	Any microsphere in this brochure
Weight reduction	Glass Bubbles or Hollow Ceramic Microspheres



**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.

## 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 Specialty Materials Division, **800-367-8905**.

For other 3M global offices, and information on additional 3M products, visit our web site at: **[www.3m.com/specialtymaterials](http://www.3m.com/specialtymaterials)**

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[www.3m.com/specialtymaterials](http://www.3m.com/specialtymaterials)

Issued: 7/04

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4830 (HB)  
98-0212-3750-2