3M™ Microspheres
Selection Guide

Innovative Solutions for Demanding Applications

3M

Selecting microspheres for performance enhancements.

3M™ Microspheres offer a variety of inherent advantages over typical irregularly shaped mineral fillers. And 3M can offer engineered microspheres with different sizes, strengths, densities and compositions. Combining the inherent advantages with engineered features provides a wide choice of unique potential enhancements to help you meet specific processing and end use requirements of many applications.

More than one type of microsphere may be appropriate for an application depending on requirements for texture, processing equipment and cost. Smaller spheres can help provide a smoother feel. And some equipment can damage lower strength spheres. The following charts present 3M microspheres commonly considered for many typical applications.

Application Ideas	Potential Enhancements*	Microspheres	Considerations
Adhesives (aerospace)	Weight reduction, reduced shrinkage, high filler loading/reduced VOCs.	K25	Low cost.
		S32, K37	When processing requires higher strength.
		A16/500, A20/1000, D32/4500	For high performance.
Adhesives (general industrial)	Reduced shrinkage, high filler loading/ reduced VOCs.	G-600	325 mesh particle size.
Bowling ball cores	Density control.	K1	Low cost.
		K15, K20	When processing requires higher strength.
Buoyancy	Cost reduction, weight reduction, water resistance, sandability/machinability	A16/500, A20/1000, H20/1000, D32/4500	For high performance.
		K1, K15	Shallow water flotation.
		K20, K25	Deep water flotation.
Cast urethane	Cost reduction, sandability/machinability, reduced warpage/shrinkage, weight reduction.	K1, K15	Low cost, low strength.
		K20	Commonly used.
Caulks	Reduced shrinkage.	K1	Low cost.
		K15, K20	When processing requires higher strength.
		S15	Small particle size for smooth texture.
		S22	Small particle size for smooth texture.
Cultured marble	Sandability/machinability, weight reduction, thermal shock resistance.	K1	Low cost.
		K15, K20	When processing requires higher strength.
Epoxy flooring	Cost reduction, improved flow, increased chemical/ abrasion resistance.	G-800, G-850	Lowest cost 3M™ Ceramic Microsphere. Least surface area.
Furniture (cast polyester)	Cost reduction, sandability/machinability, reduced warpage/ shrinkage, weight reduction.	K1	Low cost.
		K15, K20	When processing requires higher strength.
Golf ball cores (lightweight)	Weight reduction.	S38	Low cost
		K46, S60, S60HS	When processing requires higher strength.
Golf ball cores (regular weight)	Improved moldability and flow, increased compression strength.	G-800	Lowest cost 3M ceramic microsphere.
Injection molded/ extruded composites	Lightweight, improved dimensional stability, improved productivity	iM30K	Where extrusion/molding requires very high strength
Marine putties	Cost reduction, weight reduction, reduced shrinkage/warpage.	K1	Low cost.
		K15, K20	When processing requires higher strength.

* Actual enhancements realized may vary depending on a variety of factors, some of which are uniquely within the user's knowledge and control. As a result, it is essential that the user evaluates the 3M product to determine whether it is fit for a particular purpose and suitable for the user's method of application.

Application Ideas	Potential Enhancements*	Microspheres	Considerations
Paints (architectural)	Improved scrubbability, burnish and stain resistance.	W-210, W-410 W-610	White for easy color matching.
Paints (industrial & maintenance)	Gloss control, hardness, corrosion resistance, abrasion resistance, higher solids/reduced VOCs.	G-200, W-210	Smallest particle size. Least gloss reduction.
		G-400, W-410	6 Hegman grind.
		G-600, W-610	Maintenance paints.
Plywood patch	Cost reduction, sandability, reduced shrinkage.	K15, K20	Yields low density.
Polymer concrete (regular density)	Cost reduction, reduced shrinkage, higher compressive strength, improved flow.	G-800, G-850	Shape and size allows improved particle packing.
Potting compounds (lightweight)	Weight reduction, reduced shrinkage, reduced dielectric constant, thermal insulation.	A16/500, A20/1000, H20/1000	For high performance.
		K1	Low cost.
		K15, K20	When processing requires higher strength.
Potting Compounds (regular weight)	Reduced shrinkage, thermal stress crack resistance.	G-600, W-610	Small particle size.
		G-800	Lowest cost 3M™ Ceramic Microsphere.
Powder coatings	Abrasion resistance, improved flow.	G-200, W-210, G-200 PC	Small particle size.
		G-400, W-410, G-400 PC	6 Hegman grind.
Spackling compounds	Sandability, reduced shrinkage.	K1	Low cost, commonly used.
		K15, K20	When processing requires higher strength.
		S15, S22	Small particle size for smooth texture.
Syntactic foam	Cost reduction, weight reduction.	S32, S35	Low cost
		K37, S38, S38HS	When processing or spraying requires higher strength.
Spray-up/lay-up	Cost reduction, sandability/machinability, reduced warpage/shrinkage, weight reduction.	K1	Low cost. Not recommended for spray applications.
		K15	When processing requires higher strength. Not recommended for spray applications.
		K20	When processing requires higher strength. Commonly used. Not recommended for spray applications.
		K25, S32, S35	Higher strength for spray applications.
Tape joint compounds	Reduced shrinkage, sandability.	K1	Low cost.
Tile grout	Reduced shrinkage, improved flow.	K20	Low cost.
		K25	When processing requires higher strength.
		G-800, G-850	Low cost.

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3M™ Glass Bubbles General Purpose Series

	Target Crush Strength (90% survival, psi)	True Density (g/cc)	Particle Size (microns, by volume) Distribution 10th%	50th%	90th%	Effective top size (95%)	Color (unaided eye)
K1	250	0.125	30	65	115	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	65	75	white
K20	500	0.20	25	55	95	120	white
K25	750	0.25	25	55	90	105	white
S32	2000	0.32	20	40	70	80	white
S35	3000	0.35	10	40	75	85	white
K37	3000	0.37	20	45	80	85	white
S38	4000	0.38	15	40	75	85	white
S38HS	5500	0.38	15	40	75	85	white
K46	6000	0.46	15	40	70	80	white
S60	10,000	0.60	51	30	55	65	white
S60/HS	18,000	0.60	11	30	50	60	white
iM30K	28,000	0.60	9	16	25	29	white

3M™ Glass Bubbles Floated Series

	Target Crush Strength (90% survival, psi)	True Density (g/cc)	Particle Size (microns, by volume) Distribution 10th%	50th%	90th%	Effective top size (95%)	Color (unaided eye)
A16/500	500	0.16	35	70	115	135	white
A20/1000	1000	0.20	30	60	100	120	white
H20/1000	1000	0.20	25	55	90	110	white
D32/4500	4500	0.32	20	40	70	85	white
H50/10,000 EPX	10,000	0.50	20	40	50	60	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 data pages for additional technical information.

3M™ Ceramic Microspheres

	Target Crush Strength (90% survival, psi)	True Density (g/cc)	Particle Size (microns, by volume) Distribution 10th%	50th%	90th%	Effective top size (95%)	Color (unaided eye)
G-200	>60,000	2.5	1	4	10	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
G-200 PC	>60,000	2.5	1	4	9	12	gray
G-400 PC	>60,000	2.4	1	5	14	24	gray
W-210	>60,000	2.4	1	3	9	12	white
W-410	>60,000	2.4	1	4	15	24	white
W-610	>60,000	2.4	1	10	28	40	white

Beyond microsphere enhancements... technical support and worldwide service

It can take more than quality products to help you solve complex problems. That's why 3M also provides technical support, a proven global service network, and ongoing R&D to help you meet your ever-evolving needs.

R&D... expanding our capabilities to serve you

With a focus on continuous improvement and innovation, 3M R&D takes you beyond our current microsphere technology – microencapsulation, surface treated products and metal coated products.

Technical support

Our technical support team offers the expertise and depth of 3M. Together, with our technically skilled authorized distributor network, we field the largest team in the industry to help you solve problems, optimize formulations and simplify material handling.

Resources

3M Microspheres 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. Users benefit from 3M's broad technology base and continuing attention to product development, performance, safety and environmental issues.

For additional technical information on 3M microspheres in the United States, call 3M Energy and Advanced Materials Division, 800-367-8905.

For other 3M global offices, and information on additional 3M products, visit our web site at: www.3M.com

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