3M™ Ceramic Microspheres
Paints and Coatings Applications Profile

The Start of a Better Finish

3M

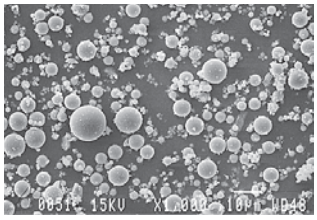
Eight ways to help you reduce costs while enhancing

3M™ Ceramic Microspheres are high-strength, inert fine particles with intrinsic hardness. 3M microspheres are engineered to help you reduce costs, increase solids, enhance properties, and improve processability.

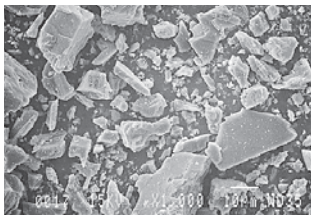
1 Lower viscosity and improved flow

Unlike many irregularly shaped fillers, 3M ceramic microspheres roll easily over one another, similar to ball bearings. This contributes to lower viscosity, better flow, and improved sprayability.

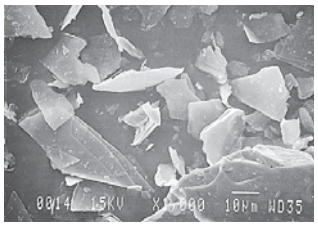
Powder coating with a spherical dispersion improves material handling for consistently smooth surfaces.



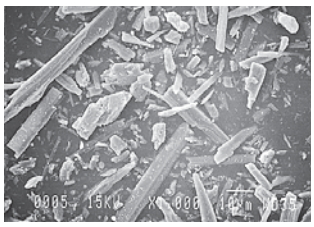
3M Microspheres W-410



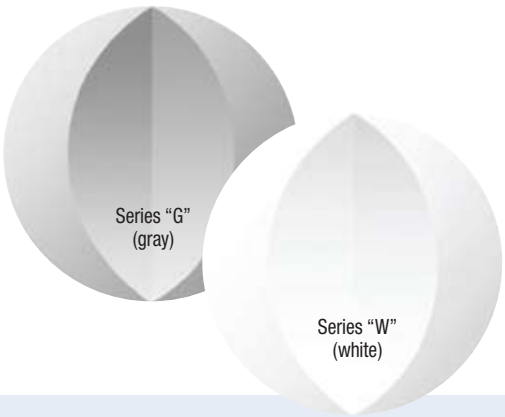
Calcium Carbonate



Mica

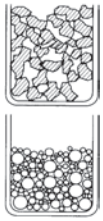


Wollastonite



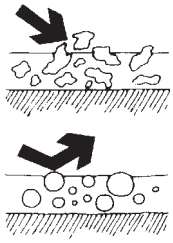
2 Higher filler loading to reduce costs

With the lowest surface area to volume ratio of any shape, 3M ceramic microspheres reduce resin demand and increase volume loading capacity. Smaller spheres may fill voids between larger ones to enhance packing for higher solids/lower VOCs, and reduced costs.



3 Burnish resistance and hardness

Mohs 7 hardness and spherical shape contribute to increased burnish resistance and hardness of the finished surface. Surfaces stay new looking longer to save the time and cost of touch-ups or repainting. With ordinary fillers, soft or jagged particles on the surface often break or wear away.



High-scrub, crystalline silica-free interior paints maintain optical qualities after repeated cleaning

4 Gloss control

Many gloss control materials can increase viscosity. But increasingly higher levels of 3M ceramic microspheres can help incrementally lower gloss without significantly increasing viscosity in many applications.

Military equipment requires a low-gloss camouflage finish that’s resistant to abrasion and corrosion.

paint and powder coating performance

5 Barrier effect

Tight particle packing, combined with hardness and inertness, creates a durable, low-permeation film barrier against weather, corrosion and chemicals.

Truck under-carriage coating combines lower VOCs, high solids, and corrosion resistance. Bridges and other exposed metal structures require a physical barrier against harsh environments.

6 Inert and free of crystalline silica

Because of their inert composition, 3M™ Ceramic Microspheres are resistant to a variety of chemicals. Solid ceramic microspheres are also free of crystalline silica (hollow microspheres are not).

Chemical storage tanks and piping need to present a clean, professional image while resisting harsh chemicals.

7 Radiation curable coatings

To help improve productivity and depth of cure for UV-curable coatings, white 3M ceramic microspheres are UV transparent to 250nm. The microspheres allow transmission of the UV energy through the coating. Gray and white 3M ceramic microspheres also improve the viscosity and flow/leveling in E-beam coating applications.

Radiation curable applications include:

- Potting compounds
- Patching compounds
- Wood coatings
- Overprints
- Powder coatings
- Adhesives

Potential application – UV-curable coatings for increased durability

8 Standard equipment for dispersing

With high compression strength, 3M ceramic microspheres are best added during the grind. For optimum dispersion, sand, ball and roll mills are preferred.

Equipment wear has been reported to be less than many irregularly-shaped mineral fillers of equal or lower hardness.

Application benefits at a glance

Architectural coatings
- Durability
- Scrubability
- Higher PVC
- Improved burnish resistance
- Uniformity of sheen

Powder coatings
- Improved flow
- Hardness
- Gloss control
- Cost reduction

Maintenance coatings
- Corrosion resistance
- Durability
- Lower film permeability
- High loading
- Cost reduction

Coil coatings
- Flexibility
- Gloss control
- Higher solids
- Cost reduction
- Hardness

High solids industrial coatings
- High loading with low viscosity
- Reduced VOC
- Improved hardness
- Gloss control
- Sprayability
- Cost reduction

Primers
- Improved salt spray, humidity resistance
- Higher volume solids
- Cost reduction

Water-reducible industrial finishes
- Increased volume solids
- Reduced film permeability/ improved corrosion resistance
- Hardness
- Inertness
- Gloss control
- Durability

UV-cured coatings
- High loading with low viscosity
- Cost reduction
- Sprayability
- Scrubability
- Burnish resistance

Mastics, grouts
- Improved rheology
- Higher loading
- Durability
- Reduced shrinkage

3M™ Ceramic Microspheres Product Descriptions

Product	Target Crush Strength[1]	True Density[2]	Hagman Grind[3]	Particle Size[4]				Color[5]	Comments	Application Ideas
				Distribution			Effective Top Size			
				10th%	50th%	90th%	95th%			
G-200	>60,000	2.5	7	1	4	10	12	gray	Finest standard product, least gloss reduction	Industrial paints and powder coatings
G-400	>60,000	2.4	6	1	5	14	24	gray	Medium gloss reduction	
G-200 PC	>60,000	2.5	7	1	4	10	12	gray	Refined version of G-200, least gloss reduction	Powder coatings. Refined top particle size offers fewer "seeds," resulting in a smoother surface
G-400 PC	>60,000	2.4	6	1	5	14	24	gray	Refined version of G-400, medium gloss reduction	
G-600	>60,000	2.3	3+	1	6	24	40	gray	325 mesh	Maintenance paints and adhesives
G-800	>60,000	2.2	–	2	18	75	200	gray	lowest cost/pound, broad distribution	Polymer concrete, textured coatings, epoxy grouts, and flooring
G-850	>60,000	2.1	–	12	40	100	200	gray	Fewer fines than G-800	
W-210	>60,000	2.4	7	1	3	11	12	white	Finest white product, least gloss reduction of any white grade	Light-colored, thin film coatings and powder coating
W-410	>60,000	2.5	6	1	4	15	24	white	Medium gloss reduction	Burnish-resistant wall and house paints, most light-colored industrial and maintenence products
W-610	>60,000	2.5	3+	1	10	28	40	white	325 mesh, most gloss reduction of any white grade	Maintenance paints thicker then 2 mils, low gloss paints, adhesives and decorative flooring

[1] 90% survival,psi
[2] g/cc
[3] ASTM D12-10
[4] Microns by volume
[5] Unaided eye

Other 3M™ Microspheres for specialty coatings

3M™ Ceramic Microspheres are one in a family of 3M microspheres. They have the broadest application for paints and powder coatings. 3M Glass Microspheres, however, offer enhancements for specialties such as high-build/low-slump coatings, reflective roof coatings, lower thermally conductive finishes, and low density roof coatings.

For dispersal, use low shear mixing equipment and add during the let-down stage. The following is an overview of product characteristics.

3M™ Microspheres Product Descriptions

Product	Target Crush Strength[1]	True Density[2]	Particle Size[4] Distribution 10th%	50th%	90th%	Effective Top Size 95th%	Color[5]	Comments	Application Ideas
K1	250	0.125	30	65	110	120	white	Most economical 3M ceramic microsphere	Low thermal conductive coatings
S15	300	0.15	25	55	90	95	white	Small particle size	Caulks, sealants
S22	400	0.22	20	35	60	75	white	Smaller, tighter particle size range and higher strength than comparable “K” series	
S32	2000	0.32	20	40	75	80	white		Spray applications
S38	4000	0.38	15	40	75	85	white		
S60	10,000	0.60	15	30	55	65	white	High strength	
S60HS	18,000	0.60	11	30	50	60	white	Strongest glass microsphere	

[1] 90% survival,psi
[2] g/cc
[3] ASTM D12-10
[4] Microns by volume
[5] Unaided eye

Improved production enhanced performance

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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