

# High Performance Solid Glass Polymer Additives

POTTERS IS A WORLD LEADER, WITH OVER 100 YEARS OF EXPERIENCE IN MANUFACTURING GLASS BEADS.

## Description

Spheriglass® solid glass spheres are a performance additive for thermoplastic and thermosetting resin systems. Technical and economic advantages include enhanced processing and reduced manufacturing costs. The material characteristics enable use in applications in the transportation, automotive, chemical, electronic, industrial, and engineering industries. Potters Industries is the world's leading supplier of glass spheres with resources to provide excellent technical assistance.

## Process Benefits

- Lowest surface to volume ratio
- High loading capacity
- Improved lubricity
- Increased mold flow
- Uniform dispersion
- Lower shrinkage and warpage

## Product Benefits

- Improved surface hardness and scratch resistance
- Higher flexural modulus
- Improved stress distribution
- Excellent chemical resistance

## PHYSICAL PROPERTIES OF A AND E GLASS\*

Typical Values**	A-GLASS	E-GLASS
	Soda Lime	Borosilicate
Specific Gravity	2.5	2.57
Refractive Index	1.51	1.54
Young's Modulus, 10 <sup>6</sup> psi	10.0	12.6
Hardness (Moh)	6.0	6.5
Dielectric Constant, 22°C, 10 <sup>6</sup> Hz	6.9	5.8
Softening Point, °C	735	830
Expansion Coefficient, in/in/°CX10 <sup>-7</sup>	87	32
pH <sup>†</sup>	9.4	8.5
<b>Composition %:</b>		
	A-GLASS	E-GLASS
SiO <sub>2</sub> **	71-73	54.5
Na <sub>2</sub> O	12-14	0.5
CaO+MgO	11-16	22
Al <sub>2</sub> O <sub>3</sub>	0.5-1.5	14.5
B <sub>2</sub> O <sub>3</sub>	-	8.5

\*Not meant for specification purposes

\*\*Typical Values taken from: Schneider, Samuel J., Engineered Materials Handbook, Vol. 4, 1991, ASM International

†10% solution in deionized water

\*\*No Measurable free crystalline silica content as tested by ASTM C-169

## GENERAL PRODUCT INFORMATION

Product	Particle Size Distribution**				Bulk Density* (Lbs. /cu ft.) ASTM D-3101-78		Oil Absorption* (g oil/100g. spheres) ASTM D- 83
	Mean Value** (microns)	10% Finer Than: (microns)	50% Finer Than: (microns)	90% Finer Than: (microns)	Untapped	Tapped	
<b>A-GLASS</b>							
1820	271	235	271	317	92	99	18
1922	180	140	175	220	91	95	18
2024	156	105	151	192	88	92	18
2227	119	93	116	160	88	92	18
2429	85	72	83	99	88	92	18
2530	71	59	70	95	87	92	18
3000	35	10	35	80	82	100	18
4000	25	6	20	50	75	100	19
5000	11	3	9	15	60	85	20
<b>E-GLASS</b>							
3000E	35	10	35	70	85	100	19
EMB 20	10	4	9	13	65	75	21

\*Typical values not intended for use as a specification

\*\*Volume distribution values



## Coupling Agent Coatings

Spheriglass® solid glass spheres are available with coupling agents CP-01, CP-02, and CP-03; each designed for optimum performance in specific resin systems. The coupling agents are applied in molecular layers to obtain maximum interfacial bonding between spheres and resin.

### THERMOPLASTIC RESIN SYSTEMS

Acrylics	CP-01
Acetal	CP-02, CP-03
Acrylonitrile Butadiene Styrene	CP-01
Cellulosics	CP-02, CP-03
Ionomer	CP-02, CP-03
Nylon	CP-03
PBT/PET	CP-02, CP-03
Polycarbonate	CP-02, CP-03
Polyethylene	CP-01
Polyimide	CP-03
Polymethyl Methacrylate	CP-01
Polyphenylene Oxide	CP-03
Polypropylene	CP-03
Polystyrene	CP-01
Polysulfone	CP-03
Polyvinyl Chloride	CP-03
Styrene Acrylonitrile	CP-01

### THERMOSETTING RESIN SYSTEMS

Epoxy	CP-02, CP-03
Melamine	CP-02, CP-03
Phenolic	CP-03
Polyester, unsaturated	CP-01
Silicone	CP-01
Urea	CP-03
Urethane	CP-03
Vinyl Ester	CP-01

The following chart illustrates the improved properties of coated glass sphere filled Nylon 6/6 compounds.

### NYLON 6/6

Coupling Agents Improve Properties		Unfilled	Solid Glass Spheres (40% b wt.)	
			3000 Uncoated	3000 CP-03 Coated
Flexural Strength (psi)	Dry Wet <sup>2</sup>	14300 8900	14200 8700	19000 12100
Flexural Modulus (psi x 10 <sup>5</sup> )	Dry Wet <sup>2</sup>	3.2 1.7	4.9 2.7	5.4 3.1
Tensile Strength (psi)	Dry Wet <sup>2</sup>	9400 8000	7100 5500	11100 9400
Heat Deflection Temperature		75	127	126

<sup>1</sup>The Nylon 6/6 used was "Zytel" 101 (Dupont)

<sup>2</sup>Sample conditioned for 16 hours in water at 50° C prior to testing wet physicals

### POTTERS ENVIRONMENTAL COMMITMENT

Potters respects the environment by the recycling of over one billion pounds of glass each year. Potters works closely with regulatory agencies and responsible customers around the world to ensure that we provide glass beads that don't harm employees, contaminate water supplies or land around roadways. We have set our own strict standards and voluntarily perform XRF analysis and other quality control procedures on incoming raw materials to ensure our glass beads are safe and meet heavy metals limitations.

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**[www.pottersindustries.com](http://www.pottersindustries.com)**

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