E-SPHERES® Hollow Ceramic Microspheres

TECHNICAL DATA

APPLICATION: ENGINEERED SYNTACTIC FOAM

DESCRIPTION: Advanced functional additive and reinforcing filler with spherical hollow structure and ceramic composition. Its main characteristics are lightness, high compressive strength, thermal resistance (high melting point), chemically unreactive or inert and unique off-white colour.

APPLICATION: E-SPHERES® Hollow Ceramic Microspheres (HCM) are utilised in the manufacturing of syntactic foam (synthesized composite materials). E-SPHERES® improve value and performance of products and manufacturing processes by delivering lower density, higher specific strength (strength divided by density), lower coefficient of thermal expansion, and, in some cases, radar or sonar transparency, and potential cost reduction. Typical applications include:

- Deep-sea buoyancy foams
- Helicopter and airplane components
- Thermoforming plug assist tooling
- Radar transparent materials
- Acoustically attenuating materials
- Cores for sandwich panels
- Blast mitigating materials
- Sporting goods such as bowling balls, tennis rackets
- Thermal insulating panels

These are only examples of possible applications.

ADVANTAGES	VALUE IN USE
Density and weight reduction	thanks to volume displacement by low density functional filling material
Increased stiffness	due to high compressive strength and optimum filling of interspacial voids
Improved impact resistance	owing to its capacity to absorb energy and vibration within the binder matrix
Improved synthesizing	act as miniature bearings due to its smooth surface and spherical geometry
Reduced shrinkage	as a result of its non-absorbent properties and particle size distribution
Reduced warpage (dimensional error)	due to dimensional stability at higher temperatures
Improved thermal insulation	results from its low thermal conductivity and ceramic composition

Cost Saving and value added throughout the life cycle of the end products

Lower formulation costs	due to resin extension thanks to optimised area of contact and low SG
Transport costs	by producing a lighter final product
Packaging costs	less expensive packaging materials needed for lighter products
Lower labour and Installation costs	easier handling materials during production and faster to install components

CHEMICAL COMPOSITION: These figures are for general representation only, not for specification purposes:

Silicon Dioxide SiO_2 (Silica)	55 – 60%	Iron Oxide Fe_2O_3 (Hematite)	0.4 – 0.5%
Aluminium Oxide Al_2O_3 (Alumina)	36 – 40%	Titanium Dioxide TiO_2 (Rutile)	1.4 – 1.6%

E-SPHERES® HCM can be described as aluminosilicate microspheres.

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TYPICAL PHYSICAL PROPERTIES (for general representation only, not for specification purposes)

Property	Value
Physical Form	Free flowing powder
Colour	White: SL Series, Off-White: ES Series
Geometry	Spherical shape (hollow)
Particle Size	20 – 500 microns *
Relative Density	0.65 – 0.95 g/cc
Bulk Density	0.35 – 0.45 g/cc
Compressive Strength	4,800 psi (33 MPa)
Oil Absorption	~ 7g / 100g **
pH of Water Dispersion	6 - 8
Thermal Conductivity	0.1 W/m/°C
Melting Point	1500 °C – 1800 °C
Hardness	6 Mohs scale
Refractive Index	1.53

* Consult product specifications for grades of particle size and distribution.
** g of oil / 100g E-SPHERES®

GENERAL: E-SPHERES® HCM when utilised in formulated compounds, provide major benefits and add value through enhanced performance of syntactic foam materials and components; enabling manufacturers to further improve existing products or assist to develop new ones.

E-SPHERES are not classified as dangerous goods - they are non combustible, non flammable, non reactive, non corrosive, non toxic. E-SPHERES® are compatible with both phenolic and epoxy resin systems. For more about formulating information or suggested starting point, please contact Enviroshperes.