



E-SPHERES® Hollow Ceramic Microspheres

TECHNICAL DATA

APPLICATION: BRAKE PADS AND FRICTION MATERIALS

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 widely utilised in the industry to formulate advanced friction materials such as brake pads and clutch discs. E-SPHERES® improve value and performance of products by delivering components of longer lifespan, quieter operation, stable under a wider range of temperatures, brakes systems which produce less visible dust and potential cost reduction. Typical applications include:

- Automotive disk brake pads
- Motorcycle's brake pads
- Drum brake linings
- Truck brake components
- Agricultural machinery components
- Train blocks
- Automotive and trucks clutch discs
- Industrial clutches

These are only examples of possible applications.

ADVANTAGES

Density and weight reduction
 Resin extension
 Improved friction stability
 Reduced noise
 Improved thermal stability
 Longer lasting friction components
 Reduced wear on rotors

VALUE IN USE

thanks to volume displacement by low density filling material
 due to optimised area of contact (spherical shape of the particles)
 consistent performance across a wider range of temperatures
 owing to its capacity to absorb sound and vibration within the binder matrix
 as result of its dimensional stability and insulating properties
 due to hardness and less, finer dust resulting from operation
 thanks to its non-metallic composition

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

Lower formulation costs
 Transport costs
 Packaging costs
 Application costs

due to resin or binder extension and enhanced processability
 by producing a less heavy final product
 less expensive packaging materials needed for lighter products
 with longer lasting friction components when compared to semi-metallic ones

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

Silicon Dioxide SiO ₂ (Silica)	55 – 60%	Iron Oxide Fe ₂ O ₃ (Hematite)	0.4 – 0.5%
Aluminium Oxide Al ₂ O ₃ (Alumina)	36 – 40%	Titanium Dioxide TiO ₂ (Rutile)	1.4 – 1.6%

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



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 formulating friction materials, provide major advantages to end users, while manufacturers benefit from a market segment which continue to grow in popularity due to component's durability, energy absorption and decreased noise production as compared to metal counterparts which emit a grinding noise when worn. This enables manufacturers to further improve existing products or assist to develop new ones.

E-SPHERES® Ceramic Microspheres are not classified as dangerous goods - they are non combustible, non flammable, non reactive, non corrosive, non toxic. E-SPHERES® are compatible with waterborne, solvent based, epoxy and phenolic binder systems (resins). For more about formulating information or suggested starting point, please contact Enviropheres.

OTHER BENEFITS: Include improved mixing, moulding and pressing (packing) processes of dry ingredients as a result of optimum filling of interspatial voids in the filler/resin matrix.

DISCLAIMER: The information stated represents typical values; all advice given should be taken as a guide only. Both are given in good faith and are to the best of Enviropheres' knowledge; true and accurate at the time of publishing this technical data sheet. This information is intended to give a fair description of the product and its capabilities under specific conditions. No guarantee of the accuracy and integrity of the information is made and persons receiving the information should apply technical skills and conduct their own tests to determine its suitability in all respects for their particular purpose. Users are solely responsible for the application, use and outcomes when utilising the products. Enviropheres assumes no liability for the use of this information, results, products related or the outcome, as most variables are in control of the user and not Enviropheres.

Before handling, refer to the Safety Data Sheet for health and safety information of products. Ensure that all personnel using this product have read and understood this technical data sheet and the associated SDS before using the products.

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