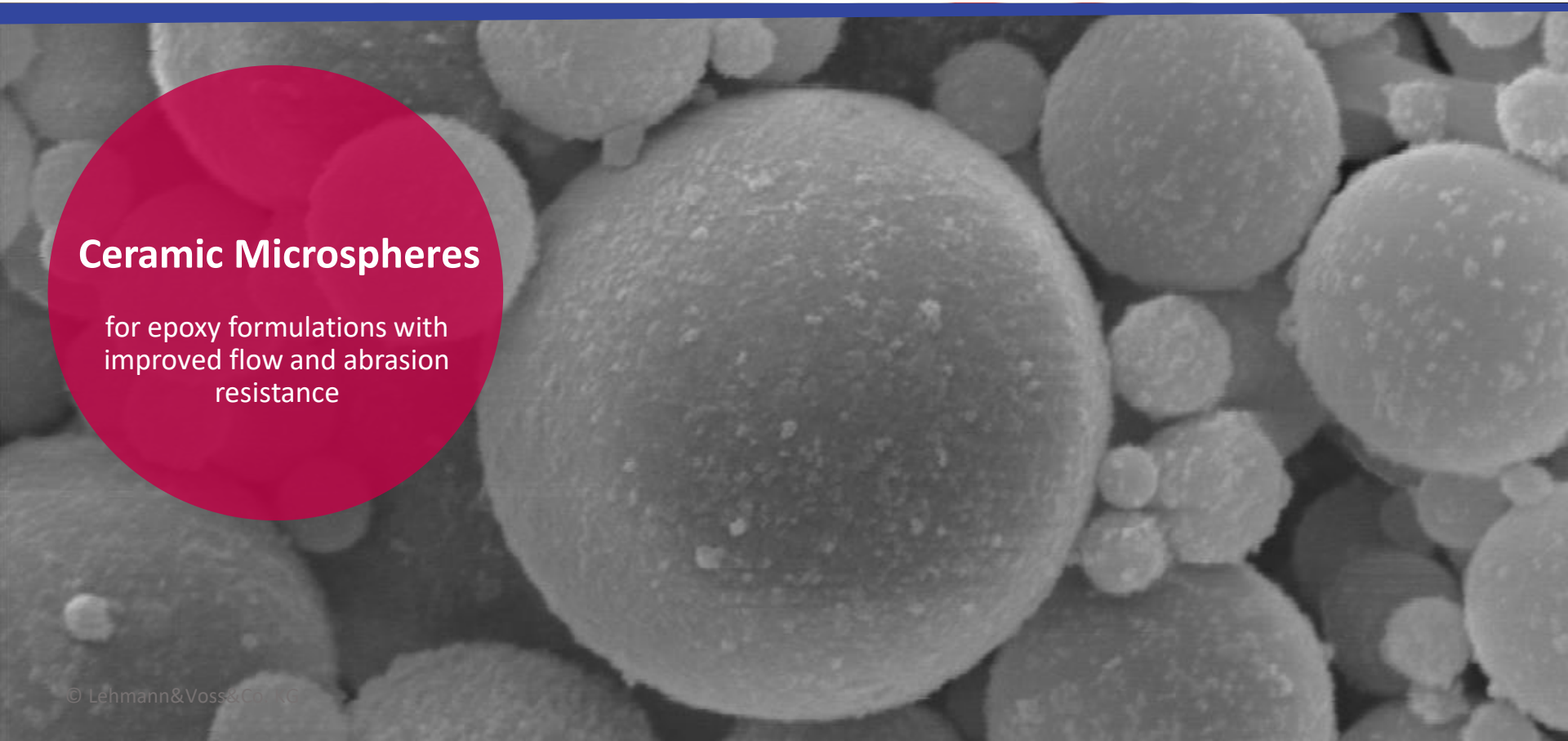
LEHVOSS Group



Ceramic Microspheres

for epoxy formulations with improved flow and abrasion resistance

Your experts for high-performance chemical and mineral specialties. Since 1894.

LEHVOSS Group

Lehmann&Voss&Co.
LEHVOSS Group

Excellence in Detail.

4th generation family-owned business

Lehmann&Voss&Co. KG
LEHVOSS Group (HQ)

- Founded in 1894 by Alfred Lehmann and Helmuth Voss in Hamburg
- Own production since 1903
- Application technology laboratory since 1907
- Diverse and specialized sales and marketing organization
- Leading expert for chemical and mineral specialties

Your experts for high-performance chemical and mineral specialties. Since 1894.

Lehmann&Voss&Co. KG
LEHVOSS Group (HQ)
Hamburg (Germany)

Subsidiaries and shareholdings

- LEHVOSS France
- LEHVOSS UK
- LEHVOSS Italia
- LEHVOSS Schweiz
- LEHVOSS Nederland
- Engredo, Dänemark
- LEHVOSS Iberia
- LEHVOSS Polska
- LEHVOSS North America
- LEHVOSS Shanghai
- LEHVOSS Korea

Network

- Global sales network of distribution partners and agents
- Worldwide sourcing by own procurement organization
- Worldwide logistics hubs

Your experts for high-performance chemical and mineral specialties. Since 1894.

LEHVOSS Group

500 Mio. €
2022 turnover (consolidated)

7.000
Customers

6.500
Products

665
Experts

18
Subsidiaries
in Europe, North America and China

4
Production sites worldwide
in Hamburg, Solingen (Germany); Pawcatuck (USA); Shanghai, Kunshan (China)

5
Laboratories
in Hamburg, Solingen (Germany); Origgio (Italy); Pawcatuck (USA); Shanghai, Kunshan (China)

1
Technology center
in Hamburg (Germany)

Business areas and product ranges

Plastics and Rubber


High-performance compounds


Technical compounds


Masterbatches and additives


Composite materials


Raw materials for rubber

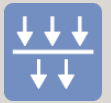
Special Chemicals and Industrial Minerals


Magnesium compounds


Rare earth / zirconium compounds


Raw materials for paints and coatings, inks, construction chemicals, adhesives and sealants


Additives for metal working fluids, lubricants and functional fluids


Products for filtration and separation

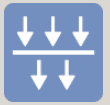
Life Sciences


Raw materials for personal care

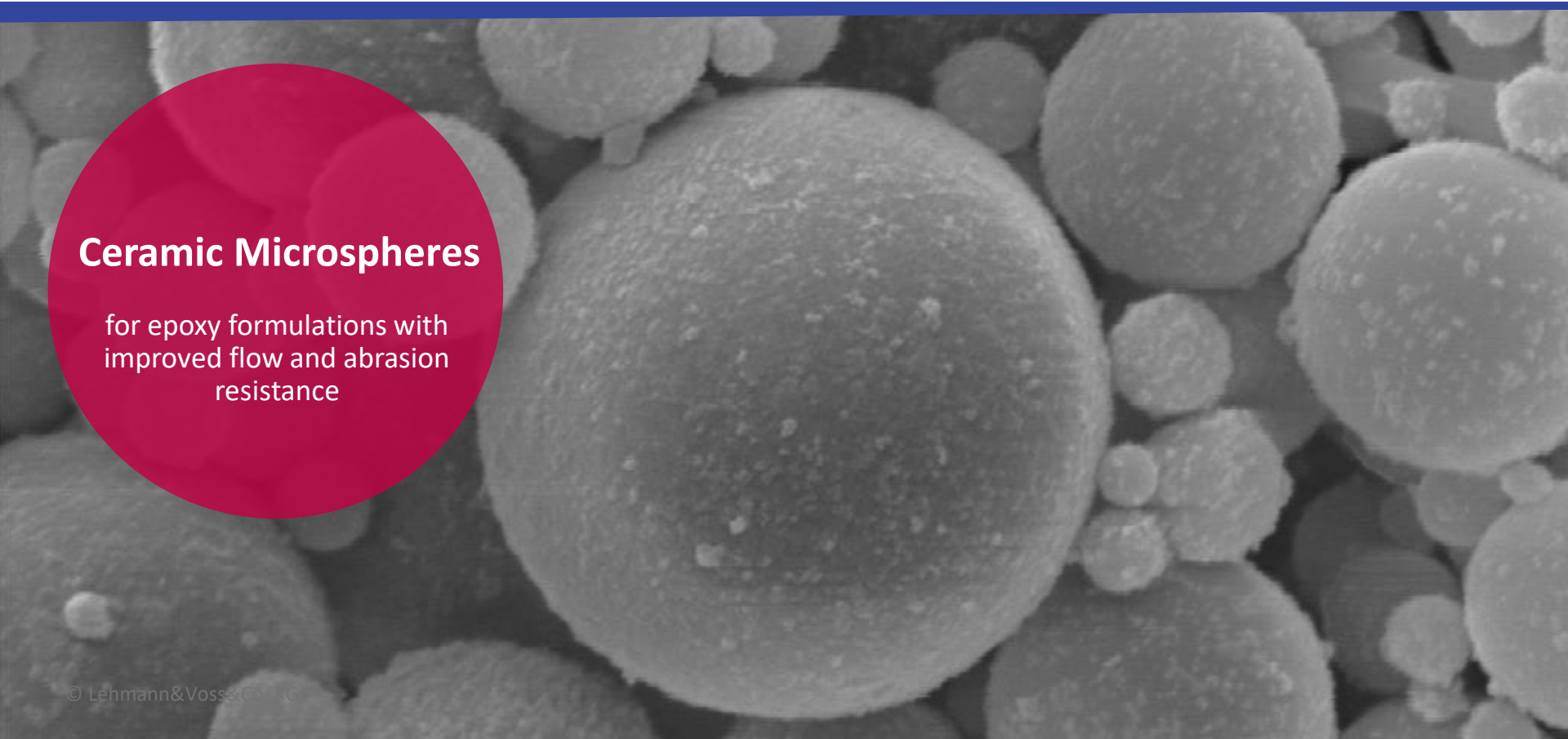

Nutrition minerals


Nutraceuticals


Pharmaceutical raw materials

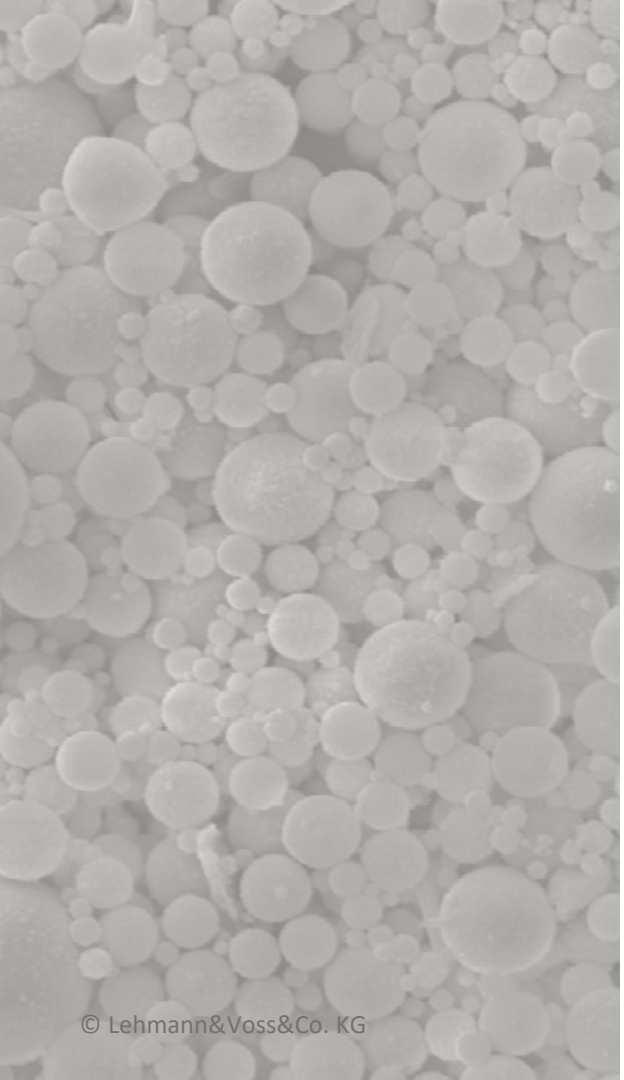

Products for filtration and separation

LEHVOSS Group



Ceramic Microspheres

for epoxy formulations with improved flow and abrasion resistance



Ceramic Microspheres

Chemistry

Description

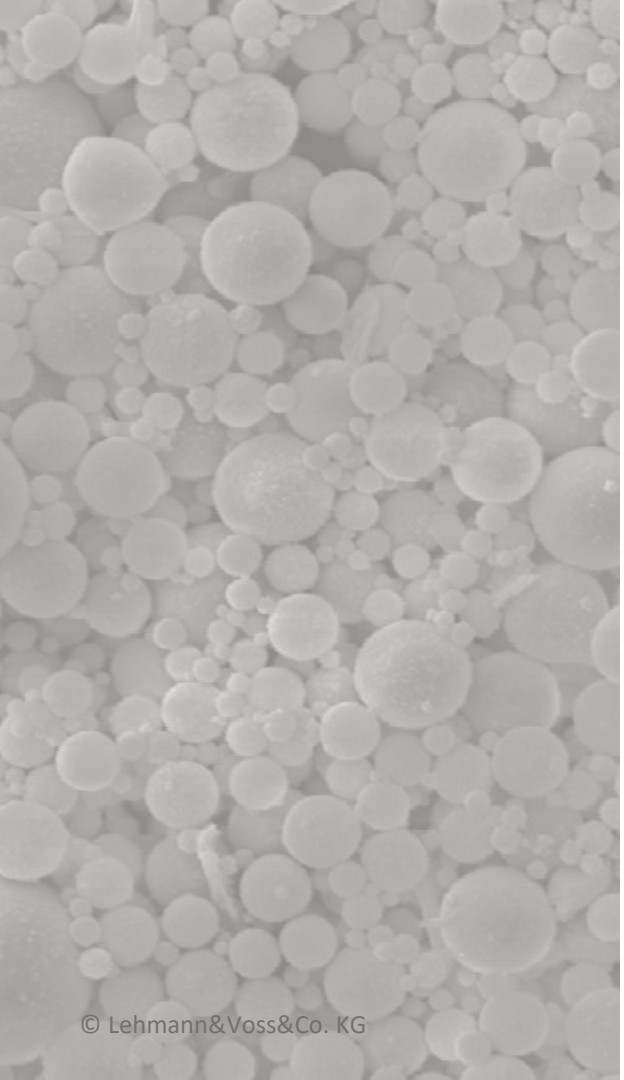
Solid aluminum silicate microspheres

Properties

- Chemically inert
- Slightly alkaline
- Non-conductive
- Hydraulically active in high pH environments

Typical chemical composition

• SiO_2	65.2
• Al_2O	18.7
• CaO	6.4
• K_2O	2.2
• Fe_2O_3	2.9
• TiO_2	1.2
• P_4O_{10}	1.2
• Others	< 1



Ceramic Microspheres

Physics

Shape
Almost perfectly spherical

Characteristics
Solid sphere

Melting temperature
approx. 1,000 °C (1,832 °F)

Loss on Ignition
approx. 3 %

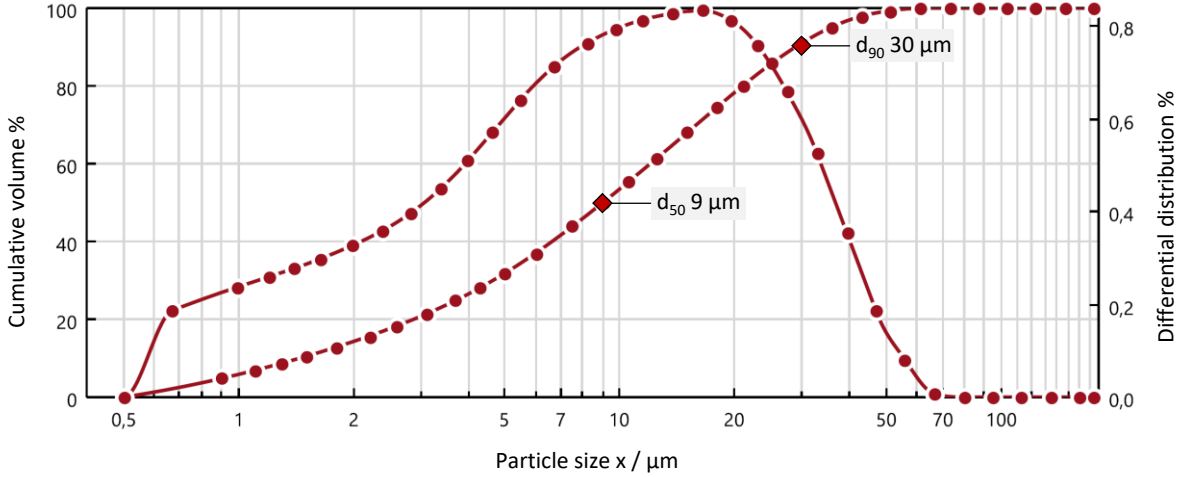
Crush strength
> 65,000 psi

Grade	Density g/cm³	d_{50} µm	d_{90} µm
XS	2.51	3.5	9.5
S	2.48	4.5	11.5
M	2.40	9.0	30.0
L	2.39	12.5	75.0
XL	2.25	50.0	200.0

Ceramic Microspheres

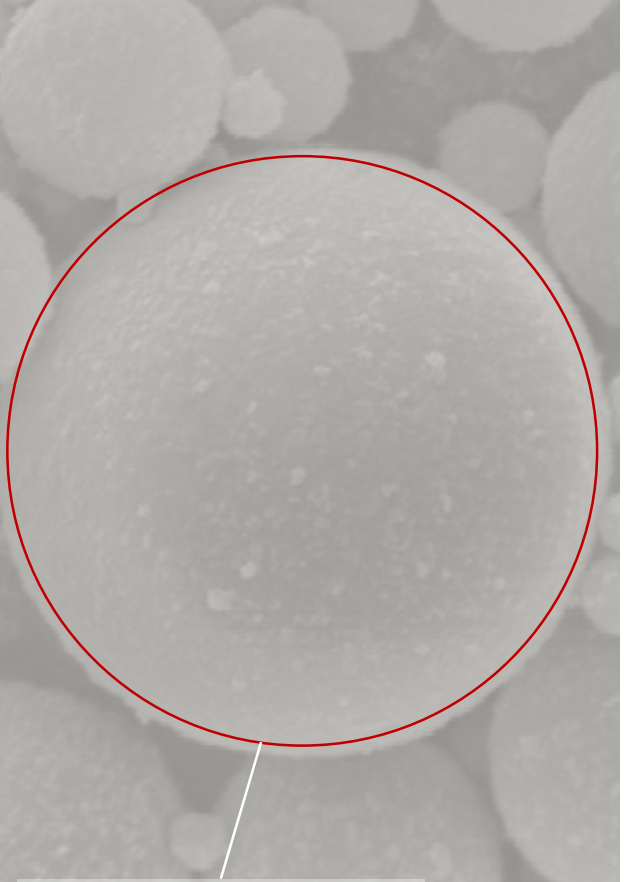
Physical properties

Typical particle size distribution Ceramic Microspheres M

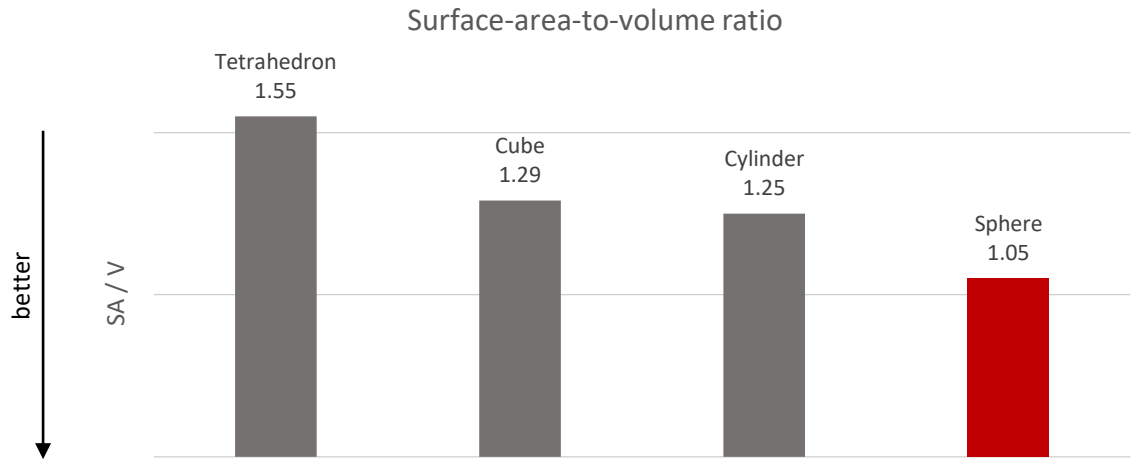


Ceramic microspheres

Spherical shape



Spheres have the smallest surface area of all geometric shapes



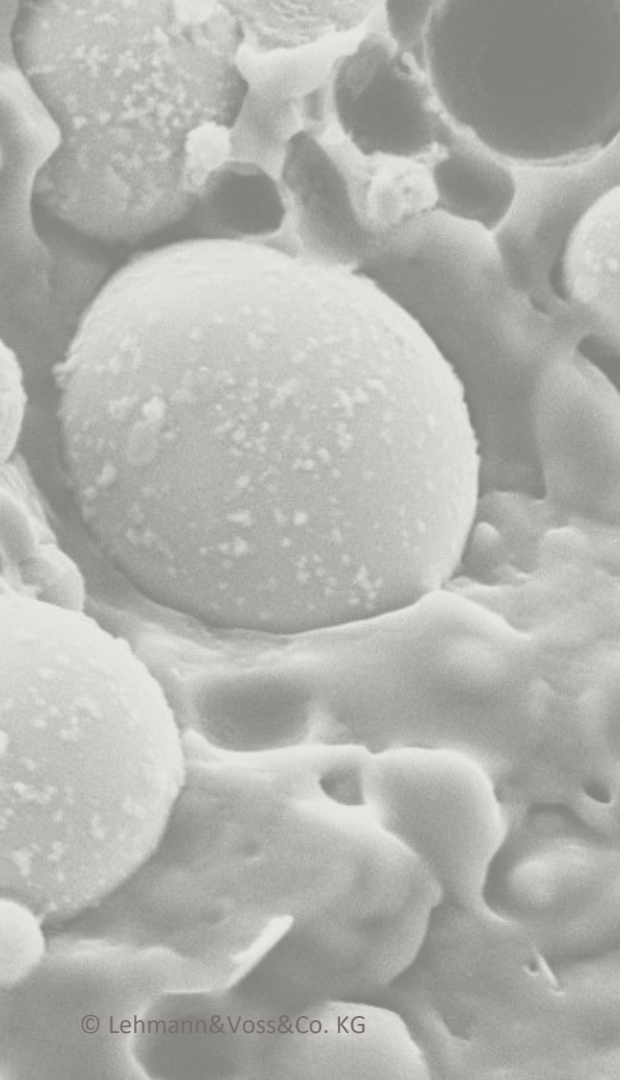
Ceramic Microspheres

Test formulation

Solvent-free 2K Epoxy Floor Coating

		Reference	VP 23 08 1 / M
Base	A/F-Epoxy resin	45.0	45.0
	Slip and leveling additive	0.3	0.3
	Defoamer	0.4	0.4
	Antiflotation agent	0.6	0.6
	TiO_2 (Rutile)	2.0	2.0
	Mica (30 µm)	15.2	15.2
	Crystalline Silica (125 µm)	11.5	-
	Barium Sulfate (3.5 µm)	25.0	-
	Ceramic Microspheres M	-	36.5
		100.0	100.0
Curing agent	Cycloaliphatic amine	25.0	25.0
	Total	125.0	125.0

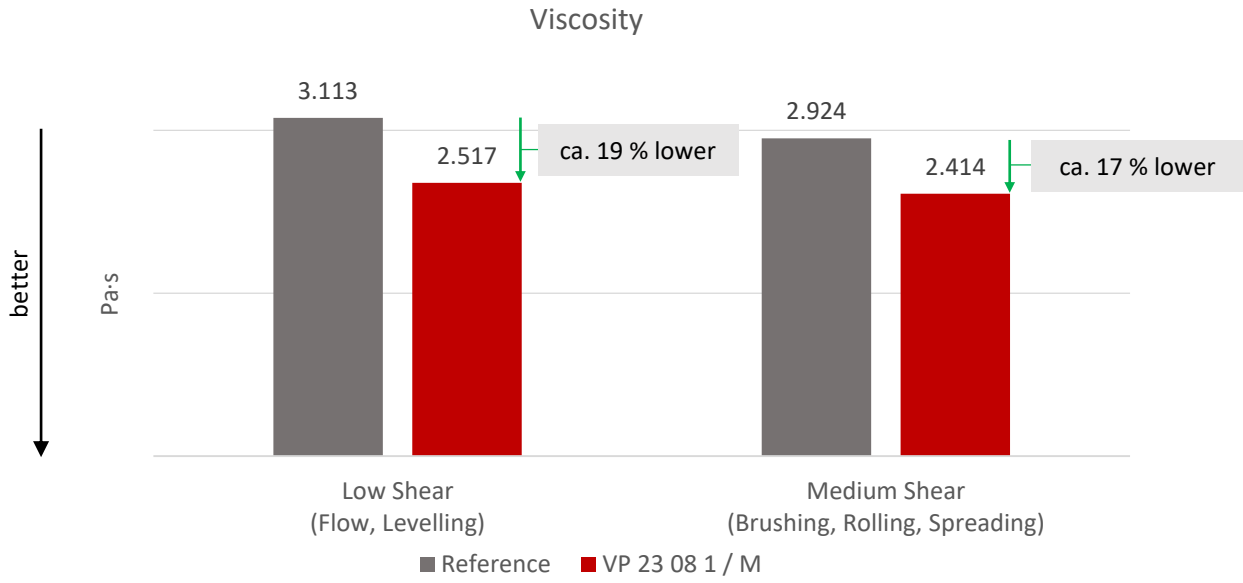
Reference formulation kindly provided by Westlake Epoxy Inc.

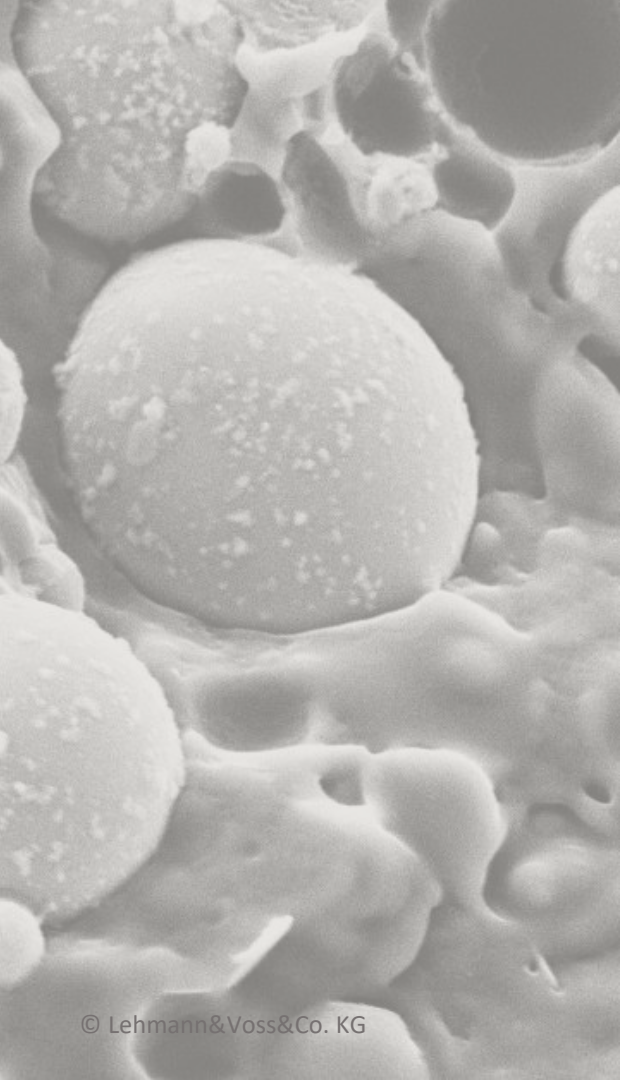


Ceramic Microspheres

Viscosity

Lower surface area results in lower viscosity





Ceramic Microspheres

Viscosity

Lower surface area results in lower viscosity

- Lower viscosity due to lower surface area (spherical shape):

  Enables either

  - reduction of binder and hardener
  - increasing filler content

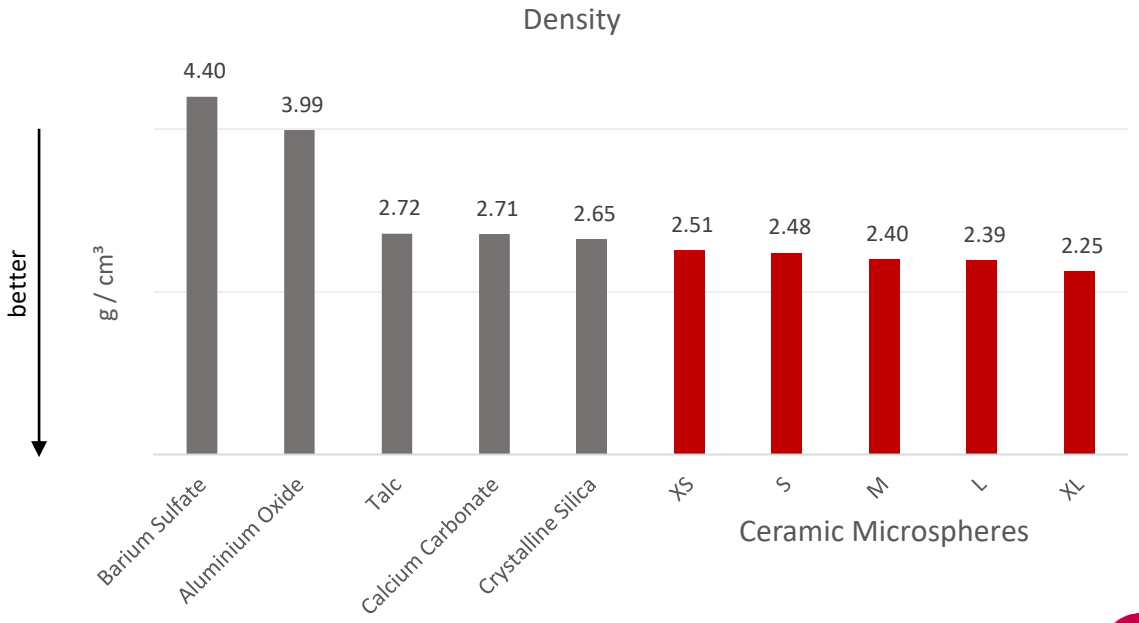
    (both result in cost reduction)

- Use in solvent-based products:
  - Reduction of the VOC content

Ceramic Microspheres

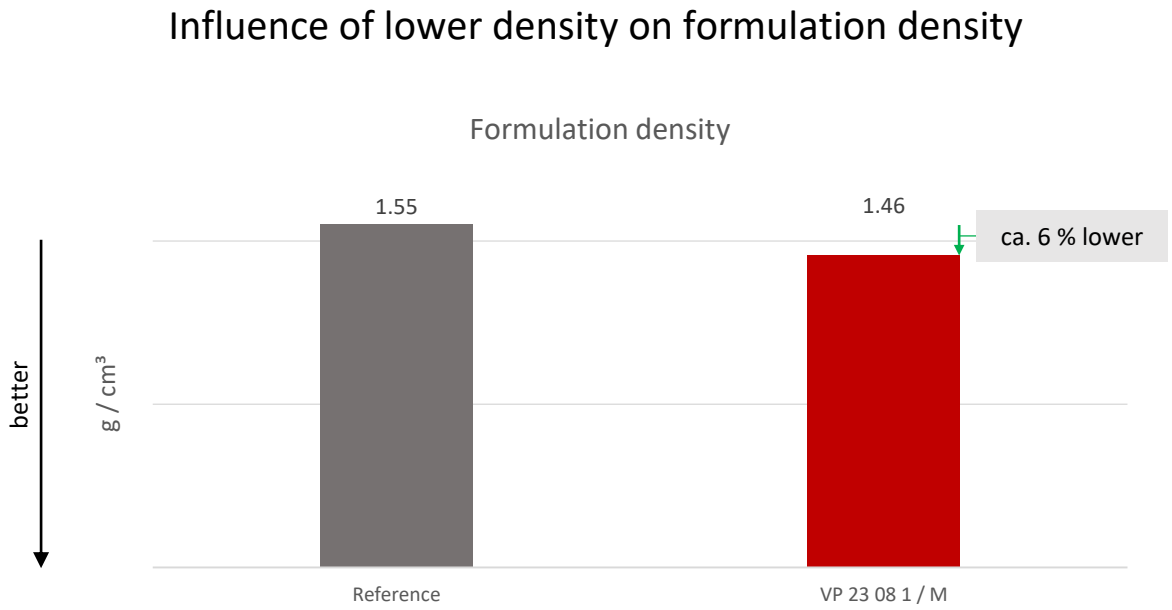
Density

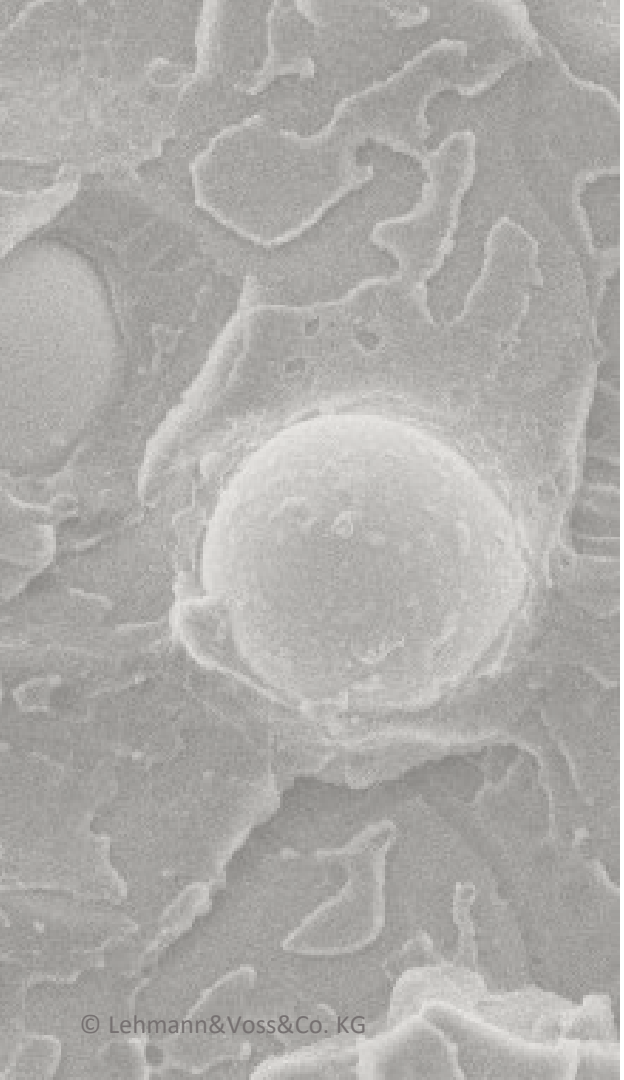
Density of ceramic microspheres compared to other fillers



Ceramic Microspheres

Density





Ceramic Microspheres

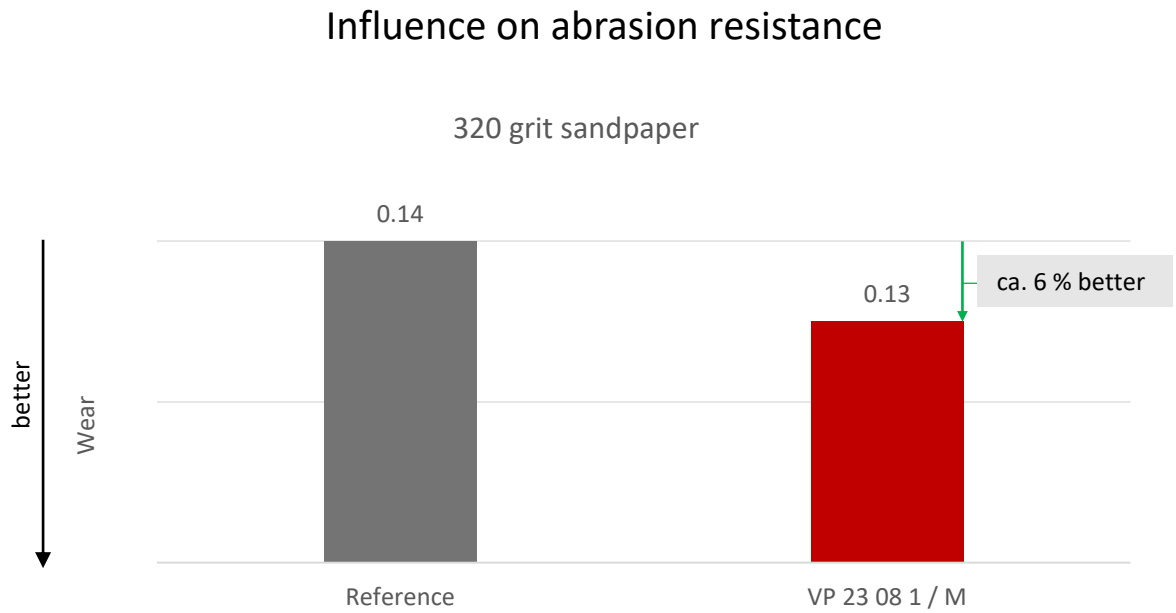
Density

Influence of lower density on formulation density

- Lower formulation density due to lower density of ceramic spheres:
  - Weight reduction while maintaining same film thickness
  - Increase film thickness while maintaining same weight
  - Same volumetric filling of packages but lower weight

Ceramic Microspheres

Abrasion resistance



Ceramic Microspheres

Abrasion resistance

Influence on abrasion resistance

- Spherical shape and high crush strength of ceramic spheres enable:
  - Increased abrasion resistance
  - Longer service life of coatings
  - Avoidance of Crystalline Silica

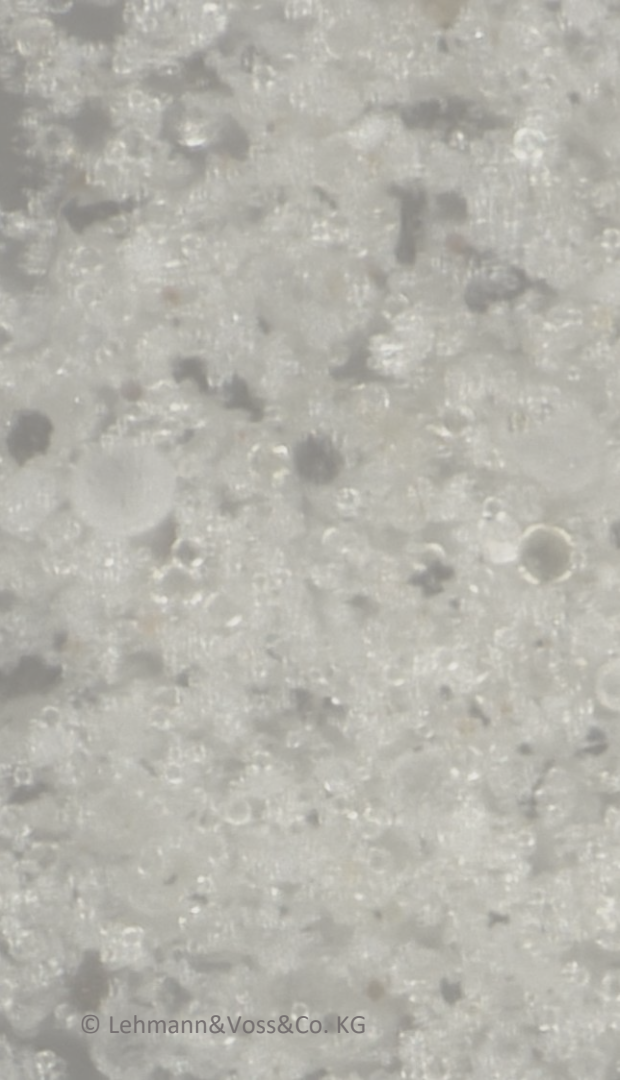
Ceramic Microspheres

Disadvantage

Color not suitable for bright shades

Reference

VP 23 08 1 / M

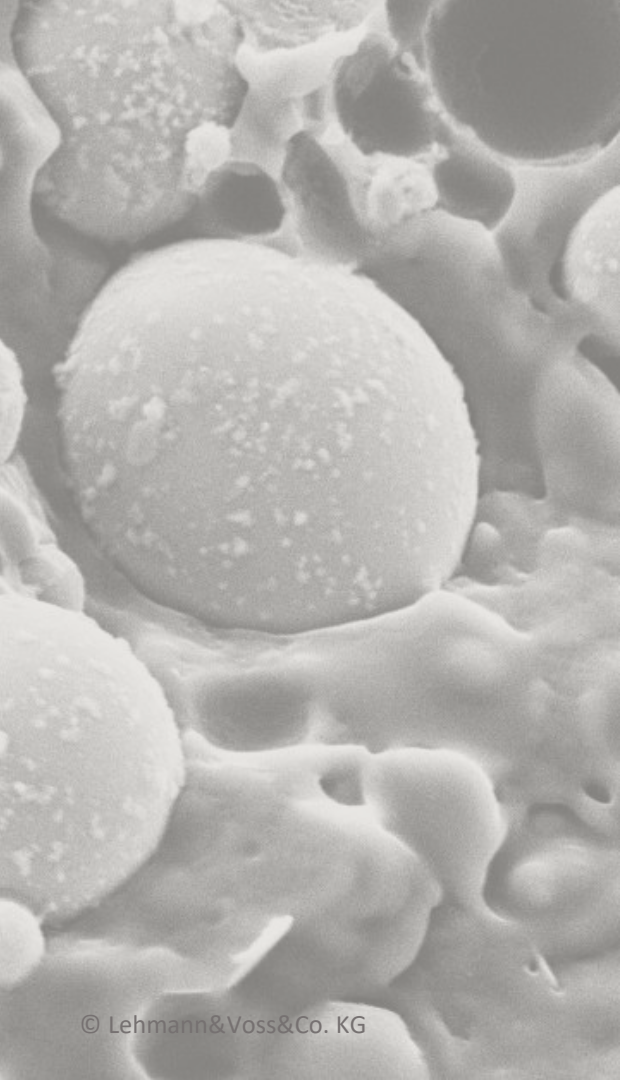


Ceramic Microspheres

Disadvantage

Color not suitable for bright shades

- Brownish-grey color:
  - Bright colors such as white, sun yellow, fire red, ... are not possible
  - Not suitable for transparent systems
  - Substantial opacity
    - Advantage for brownish-grey shades, pigment content can be reduced to achieve required opacity
    - Better in-depth protection against UV radiation



Ceramic Microspheres

Economic efficiency

Ceramic Microspheres must be expensive?

No, they are not expensive!

In addition to the performance and economic advantages they offer,

Ceramic Microspheres are not expensive.

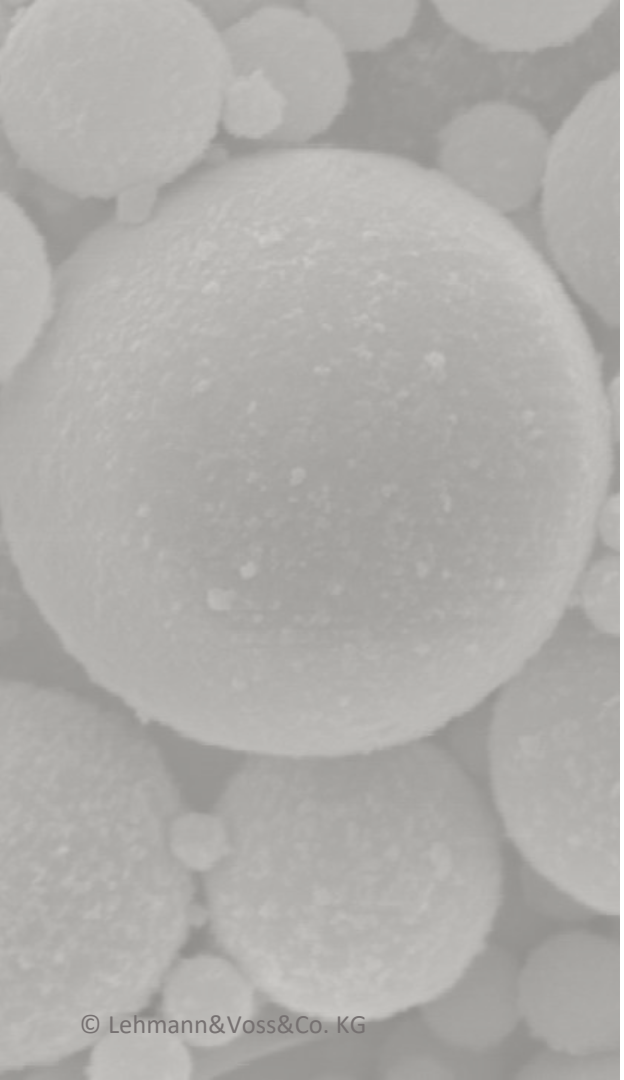
I ask for your understanding for not quoting any figures here. 😉

Ceramic microspheres

Environmental aspects

Ceramic Microspheres of this nature can be considered as 100% upcycled

- No mining
- Minimum energy for production
- Processing involves only
  - Air classification
  - Quality control
  - Packing
  - Shipping



Ceramic microspheres

Advantages

- Lower surface area
  - Results in lower viscosity
    - Enables reduction of resin and hardener
    - Enables higher filler content
    - Enables VOC reduction
- Lower density
  - Increased volume
    - Less weight with the same volume
    - More volume for the same weight
- Increased abrasion resistance
  - Longer service life
  - Avoidance of Crystalline Silica
- Excellent price-performance ratio
- 100% upcycled

LEHVOSS Group

Thank you for your attention!

Do you have any questions or want to know more?

Meet us at Booth 76!

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