SPHERILEX®

Bring abrasion resistance to your Architectural Coatings

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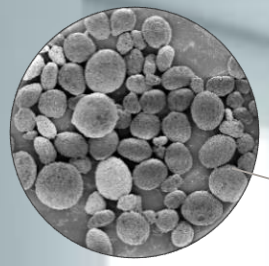
SPHERILEX®



New Silica Particle Morphology

- **Spherical particle shape**
- **Narrowed particle distribution**
- **Low oil absorption**

Improve your burnish resistance

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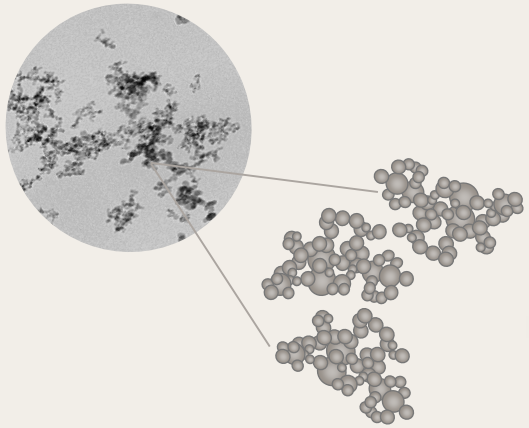
SPHERILEX®: A new highlight in the world of silica

AEROSIL®

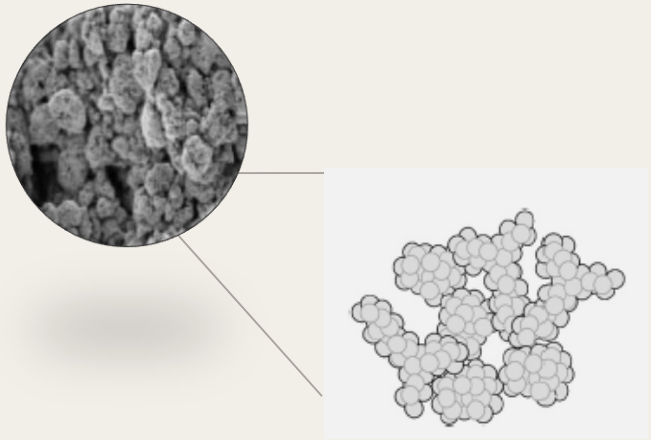


Key Driver: Aggregate Structure

Entirely open structure with a high level of surface functionality

- Thickening

ACEMATT®

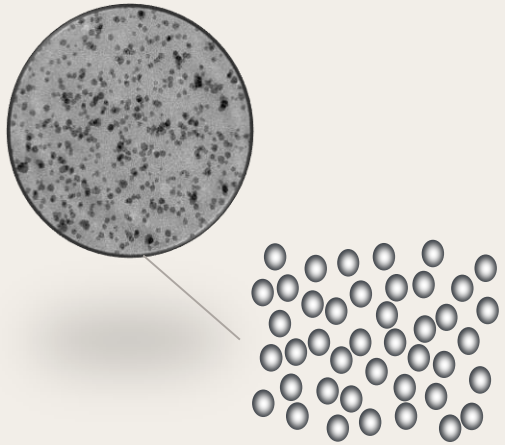


Key Driver: Surface Modification

Porous structure of interconnecting conduits

- Matting

TEGO® Nanoresins



Key Driver: Surface Modification

Colloidal silica nano particles in different solvents

- Scratch resistance

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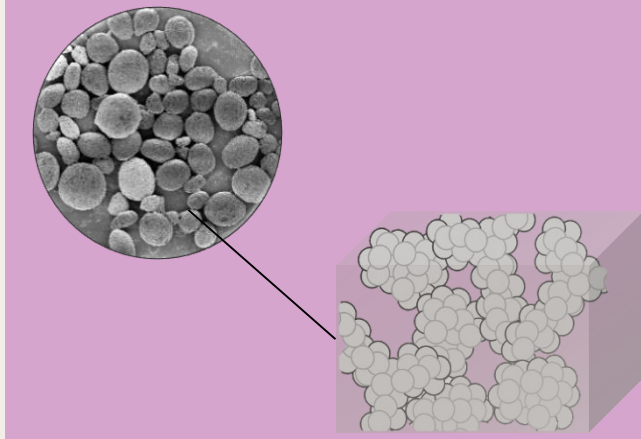

Key Driver: Particle Morphology

Spherical particle shape

- Burnish Resistance

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SPHERILEX® Production:
Controlled aggregation that grows into discreet round particles

Silicate Source

Na_2O – 3.5 SiO_2

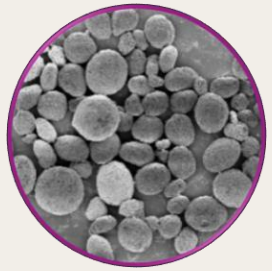
Polymerization of SiO_2 molecules drives precipitation via **Si – O – Si** bond formation

Primary particle formation – "SiO_2 Core"

Primary particles collide, resulting in interparticle siloxane bonds

Aggregation of particles fused into spherical particle form

Dryers



Spherically shaped precipitated silica

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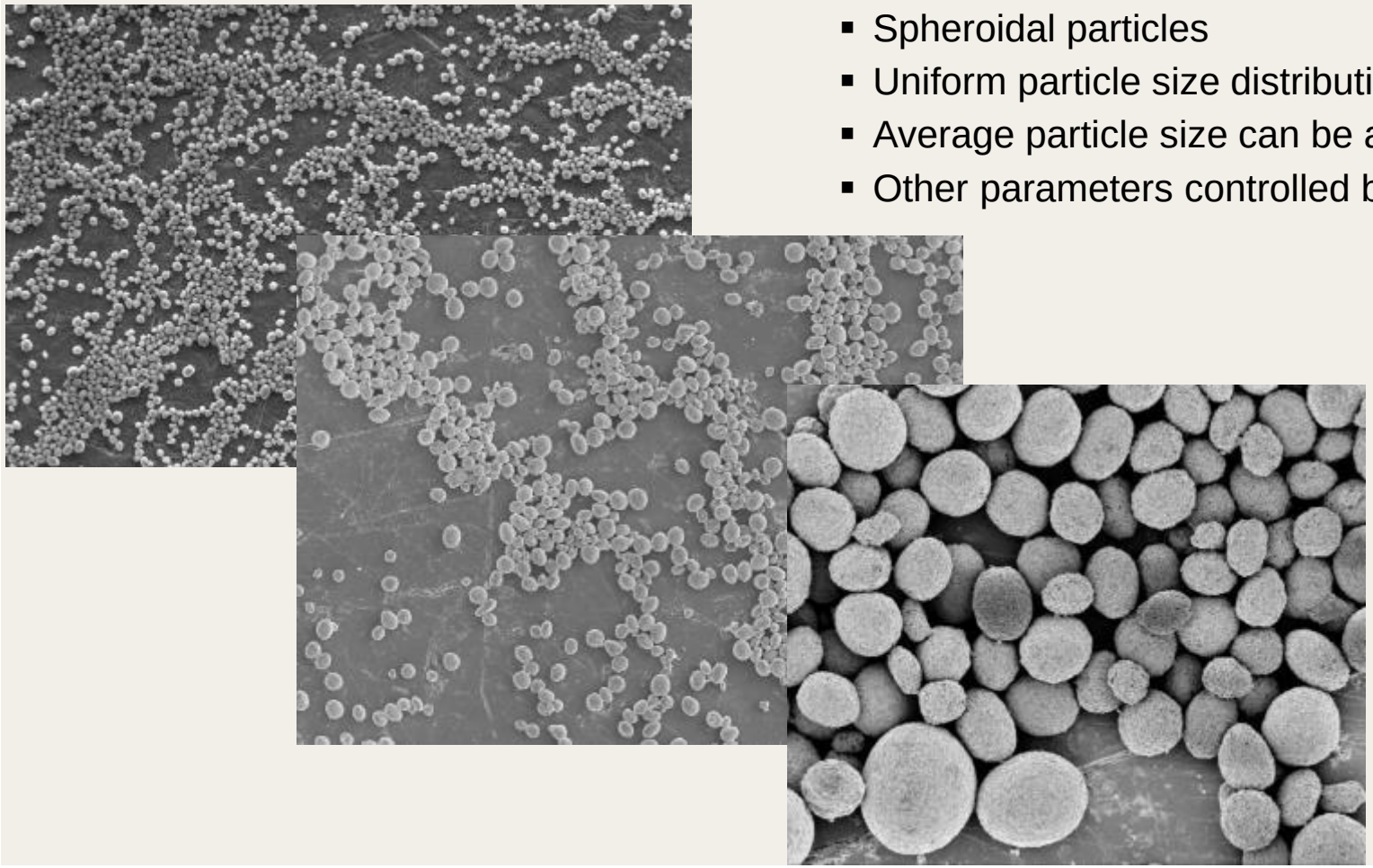
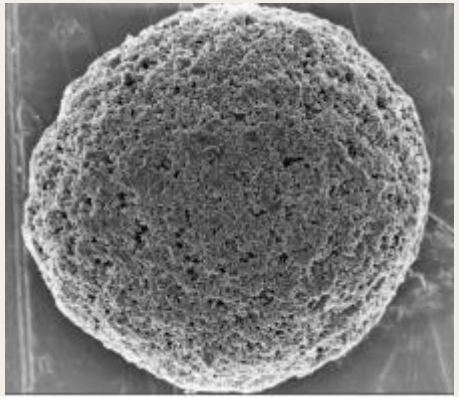
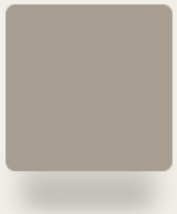
Unique Spherical Particle Morphology and Size Distribution



- Spheroidal particles
- Uniform particle size distribution out of the reactor
- Average particle size can be adjusted between 3 and 20 microns
- Other parameters controlled by rate, temperature and concentration



SPHERILEX® offers improved burnish without impacting your paint system



Burnishing and Wet Abrasion Resistance
are key formulating challenges and
important differentiating factors
for modern architectural coatings

Sheen Management

Limited viscosity build

Low Binder Demand

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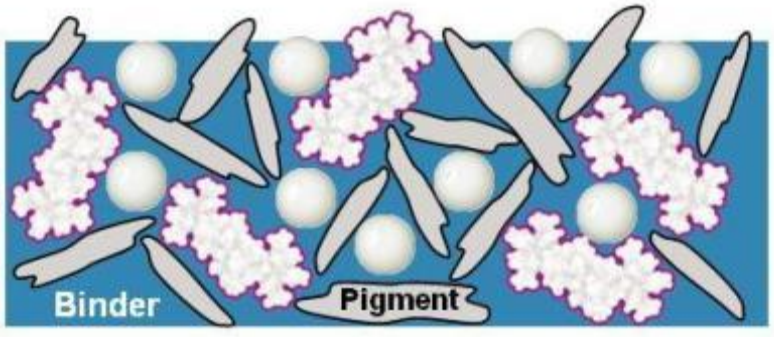
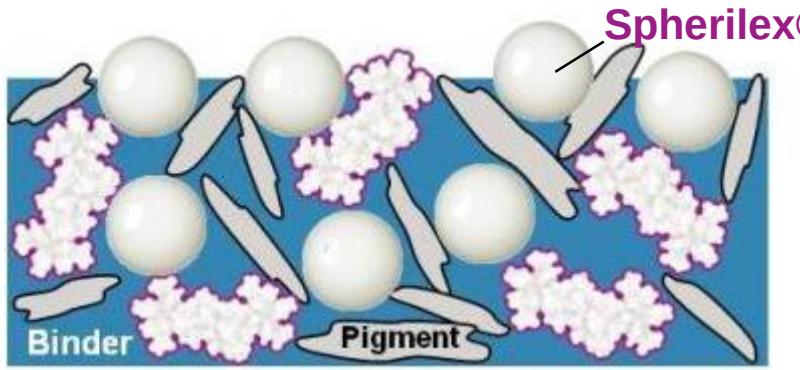
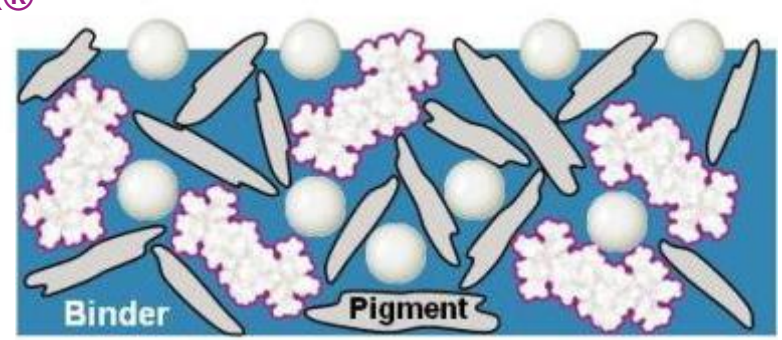
SPHERILEX® particle orientation at the surface improves burnish resistance



- **Burnishing damages or removes friable pigment particles at the film's surface.**
- Particles settle easily into the wet film. Proper particle size selection and best formulating practices help ensure beneficial surface orientation.



- **Larger spheres are more likely to remain oriented at the surface, after the film is dry.**
- Taller profile of the larger particles at the coating's surface helps to protect the surrounding film.
- Larger particle size limits how deeply they can settle in among the other pigments.
- Larger particles may reduce gloss.



- **Rheology can helps support proper orientation of SPHERILEX® without settling into the film.**
- Burnish will be optimal when particle orientation can be maintained at the surface via pseudoplastic flow behavior.
- Optimal orientation allows smaller particles SPHERILEX® to provide protective benefits without gloss reduction.

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SPHERILEX® improves burnish and abrasion resistance

What is burnish resistance?

Burnish resistance is the coatings' ability to maintain its visual appearance after being rubbed by soft types of objects like leather, sponges, cloth, or human hands.

Burnish test methods include:

- ASTM D6736 (Cheesecloth)
- Master Painters' Institute (MPI) Standard 44 (Synthetic leather chamois)
- CRGI Wet Method (Nylon bristle brush)
- CRGI Dry Method (Cheesecloth)

Evonik standard test method for burnish resistance

Application of 300µm on black Leneta cards

The samples dried at room temperature.

Burnish resistance was checked with Regmed RAS-21, 50 and 100 cycles, test weight 1800 g, and with 4 layers cheesecloth.

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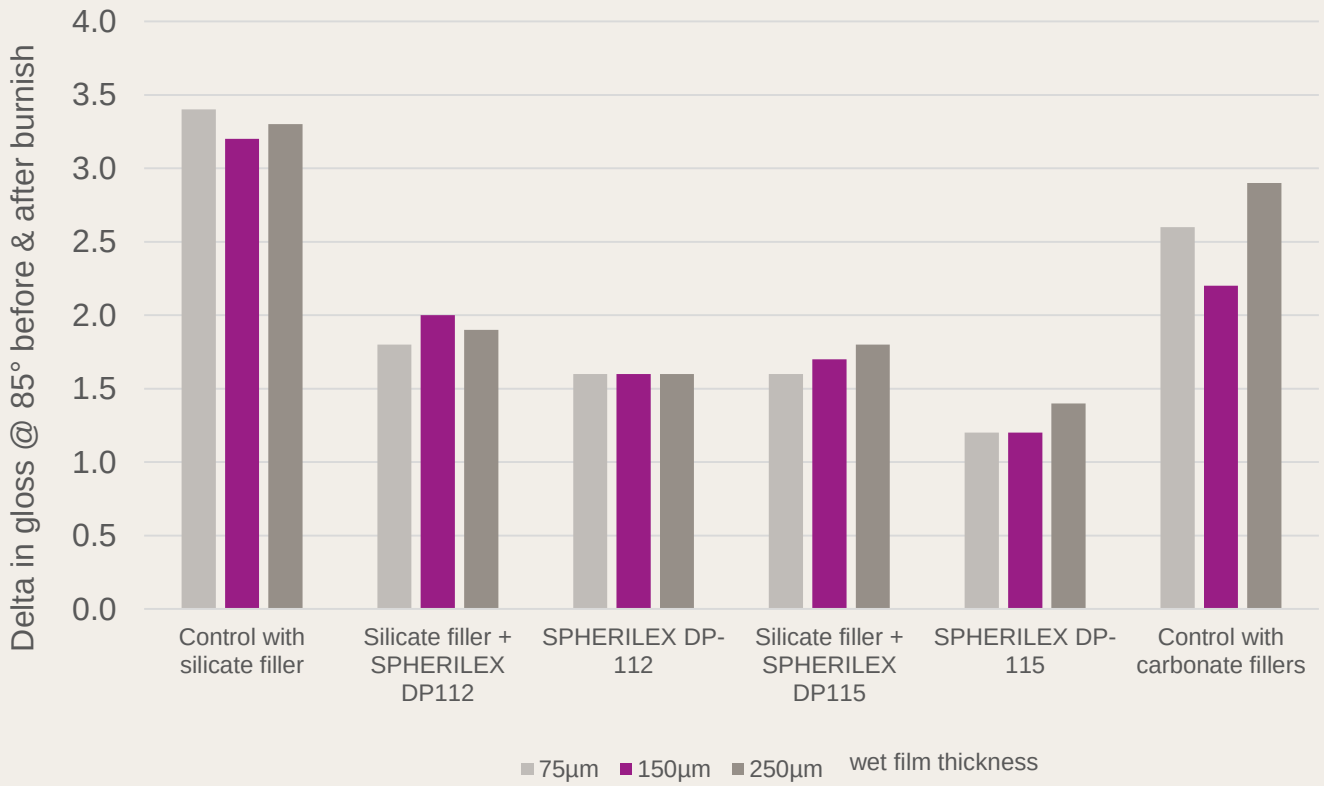
Improvement of burnish resistance in architectural coatings

SPHERILEX® improves burnish resistance compared to standard filler packages



Testing set up:

- PVC 40 acrylic emulsion paint is applied on a Leneta card with a doctor blade;
- drying of the paint for minimum 24 hours at room temperature
- Measuring of gloss at 85° before and after treating the surface
- Burnish resistance was checked with Regmed RAS-21
- Put the panel in the base of the testing machine
- Place the rubbish brick with the cheese cloth on the top of the panel
- rubbish brick :Weight 908 g; Width = 5.1 cm; Length = 10.1 cm
- Rub cycles: 50

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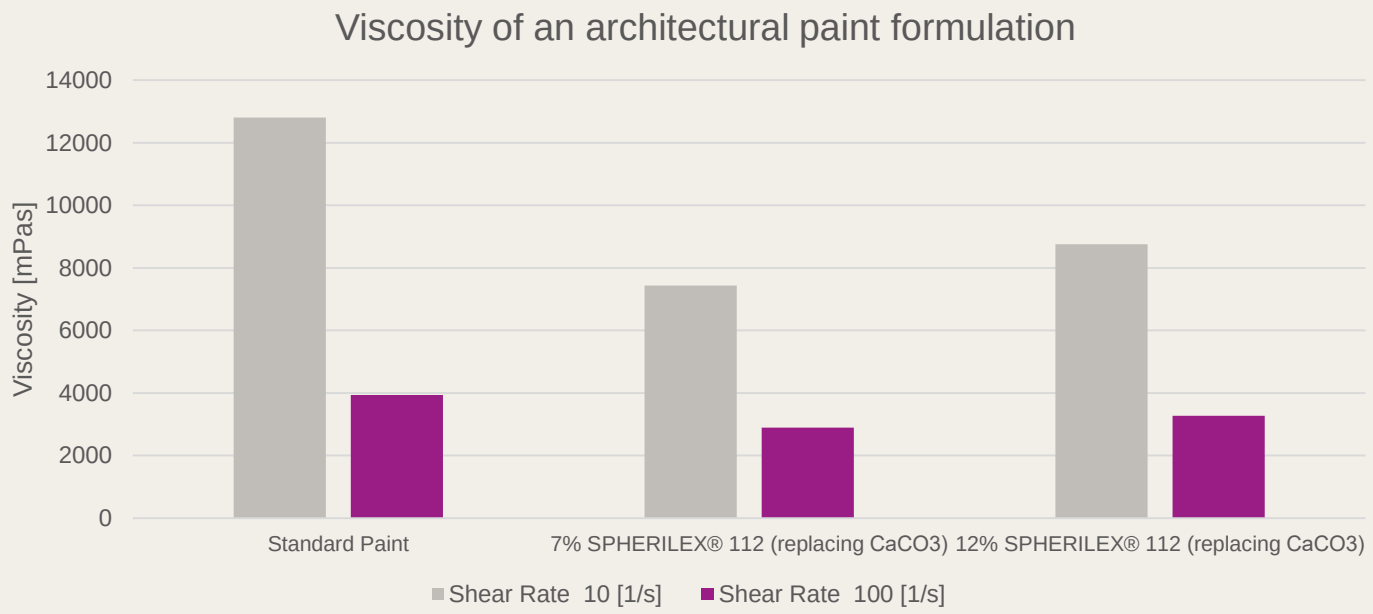
No viscosity build up compared to standard filler package

SPHERILEX® reduces the viscosity of the paint compared to use of the same amount of a standard calcium carbonate filler.



Testing set up:

Rotational plate/plate measurement in a PVC 45% wall paint with Acronal® S 790

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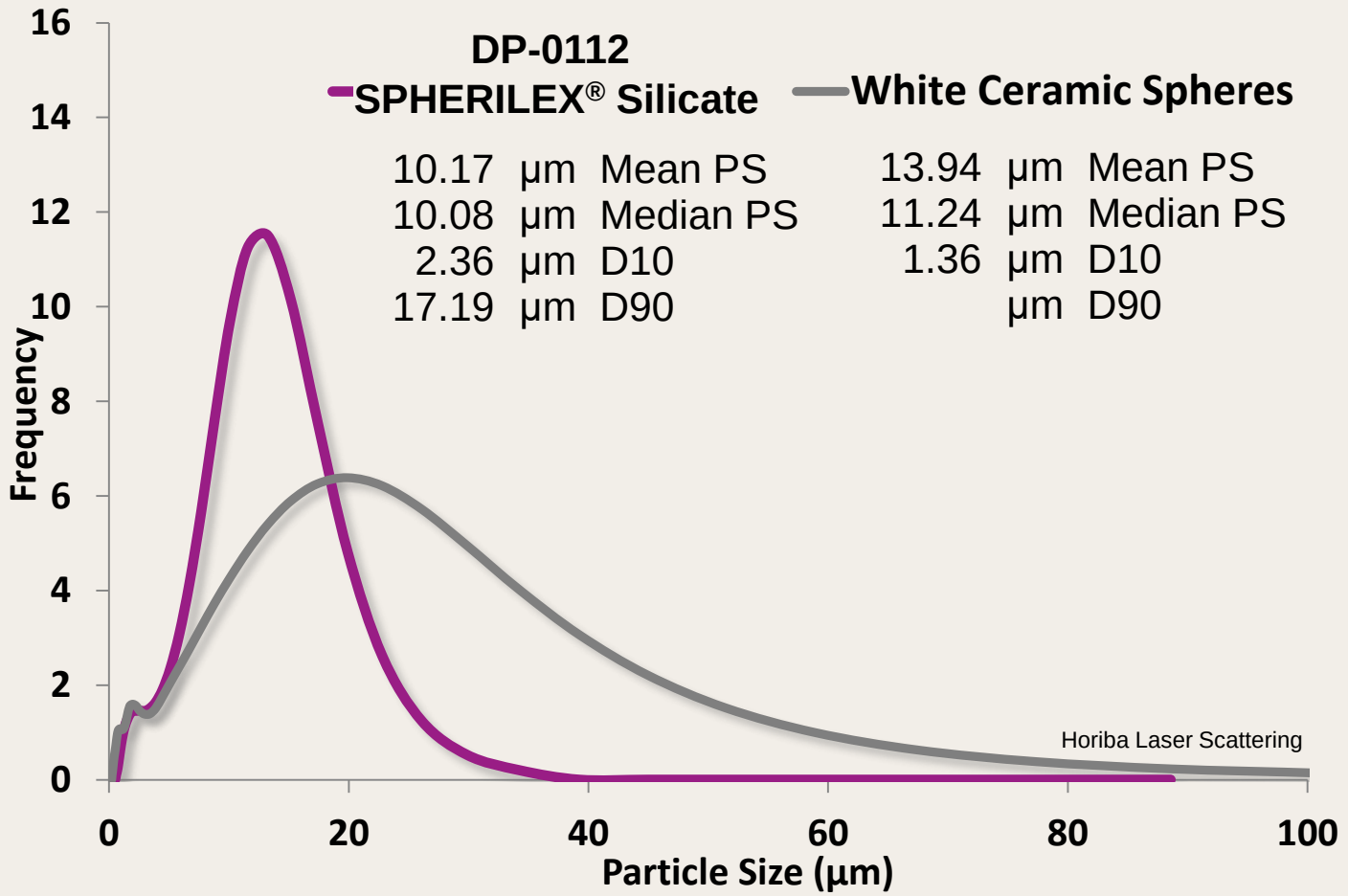
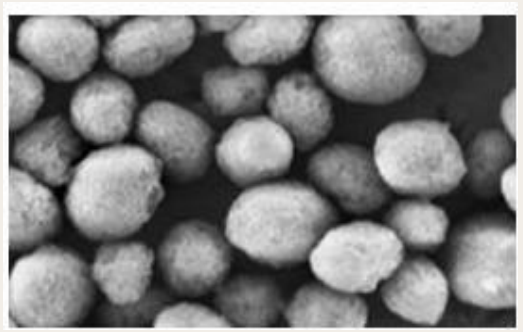
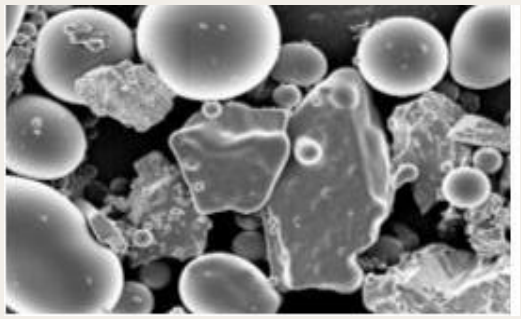
Unique particle distribution of SPHERILEX® versus other products



Comparison of spherical products 10 µm particle size



SPHERILEX®



Ceramic

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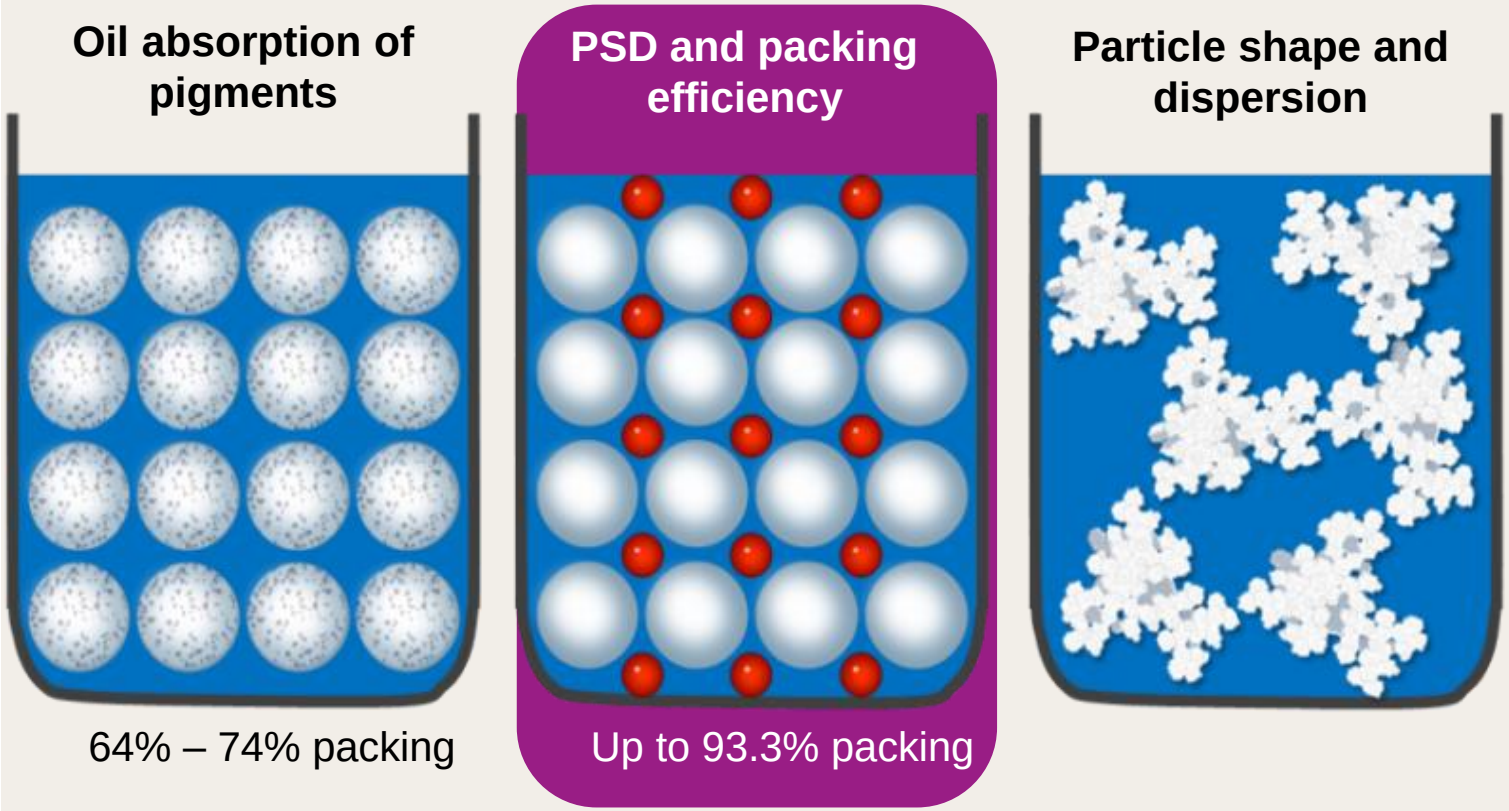
SPHERILEX® with limited impact on rheology due to packing efficiency



The amount of external phase required to surround the particles is based of

- Natural packing arrangement
- Absorption within the particles

Narrowed particle distribution and surface design creates flexibility for:

- Oil absorption
- Binder demand
- Flow properties

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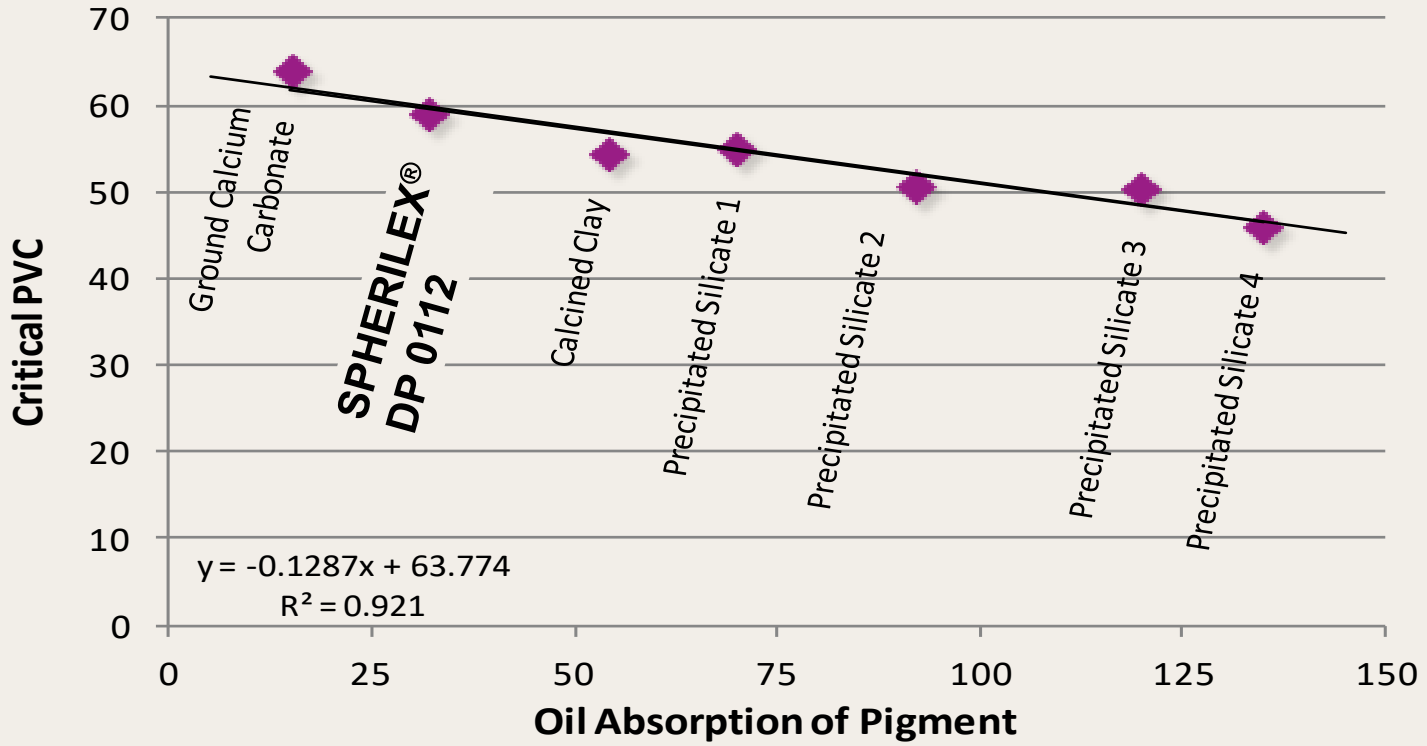
Unlike other types of silica, SPHERILEX® does not lower the CPVC

Binder demand (and thus CPVC) correlates strongly with oil absorption.



Based on WB architectural flat paint formulation in which the selected pigment was traded for binder to achieve the PVC ranges tested

SPHERILEX® behaves like a ground calcium carbonate rather than a standard precipitated silica.

Reductions in binder demand may allow reductions in coalescing solvent.

Three grades of SPHERILEX® silica

Property	SPHERILEX® DP-0111	SPHERILEX® DP-0112	SPHERILEX® DP-0115
Chemistry	Silicon Dioxide	Silicon Dioxide	Silicon Dioxide
Morphology	Spherical	Spherical	Spherical
Moisture (%)	< 5	< 5	< 7
5% pH	7-8	7-8	7-8
Sodium sulfate (%)	< 1.0	< 1.0	< 1.0
BET SA (m^2/g)	< 10	< 15	< 15
Oil absorption (cc/100g)	30-50	40-60	30-50
Median particle size (µm)	4-7	9-11	11 - 14

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Leveraging silica’s properties to deliver novel materials

Profit from our technical expertise

- Absorptive capacity

  The ability of silica particles to absorb and desorb liquids

- Particle size

  Evonik has the capability of delivering materials with average particle size of 1 to 1000 µm

- Morphology

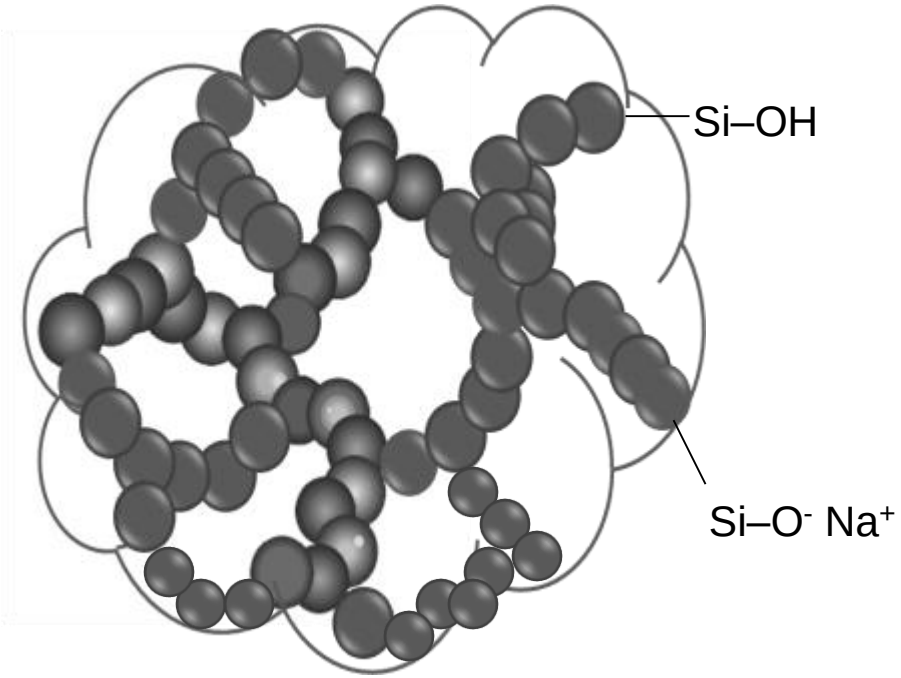
  The shape and surface structure of silica particles

- Chemistry

  Surface chemistry to control compatibility

- Composition

  Ability to make functionalized silica and produce silicates



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