Disbarit® nano
Next Generation Spacer Technology for Paints & Coatings

January 2019

TODAY: COMPLEXITY
3,500
dispersion and wetting additives.

TOMORROW: SIMPLICITY
only 1
Disbarit® nano – fits for all applications.

Solution:
substitution of organic additives by electrosterically stabilizing BaSO₄
Today: 3500 dispersion and wetting additives
The Challenge

Achieve pigment stabilization while drastically reducing the concentration of organic dispersion/wetting additives and all negative side effects in the product.
Conventional Dispersion Additives

Electrostatical Stabilization

Sterical Stabilization
## Different Dispersion Additives in Comparison

<table>
<thead>
<tr>
<th>Dispersion Additives</th>
<th>Absorption on Pigments</th>
<th>Stabilization Efficiency</th>
<th>Viscosity Reduction</th>
<th>Water Sensitivity</th>
<th>Foaming Tendency</th>
<th>Binder Compatibility</th>
<th>Costs</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Inorganic</td>
<td>Organic</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Polyacrylates</td>
<td>good</td>
<td>no</td>
<td>good</td>
<td>good</td>
<td>very high</td>
<td>fair</td>
<td>very poor</td>
</tr>
<tr>
<td>Phosphonates</td>
<td>good</td>
<td>no</td>
<td>good</td>
<td>good</td>
<td>very high</td>
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<td>Hydrophobic mod. Polyacrylates</td>
<td>good</td>
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<tr>
<td>Nonionic &quot;Surfactans&quot;</td>
<td>not good</td>
<td>good</td>
<td>good</td>
<td>good</td>
<td>medium</td>
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<td>Ionic &quot;Surfactants&quot; (Sulfates, Phosphates)</td>
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<tr>
<td>Dream?</td>
<td>good</td>
<td>good</td>
<td>good</td>
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Potential Solution: Electrosterical Stabilization

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<td>Polymeric Electrosteric Active Dispersants</td>
<td>good</td>
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Solution: Substitution of Organic Additives by Electrosterically stabilizing Particles

Which particles are suitable for paints and coatings?

- Refractive index
- Particle size
- Inertness
- Versatility

Functional inorganic additive concentrate for charged pigment surfaces

- Low-viscous dispersion of electrosterically stabilizing nano barium sulfate = Disbarit® nano
Nanoparticles as Physical Spacer

*Disbarit® nano* particles move between pigments as spacers – physically preventing sedimentation/agglomeration of pigment particles

- Electrosterical stabilization at typical coating pH of 4 – 11
- Without influencing water resistance of dried film
- Without causing foam or polymer-incompatibility with different binder systems
Positive Effects of Disbarit® nano

- Robust pigment stabilization
- Avoidance of flocculation and sedimentation
- Higher deagglomeration efficiency
- Additive cost reduction
- Color strength increase
- Viscosity reduction
- Process cost reduction
Innovative Production of *Disbarit® nano*

nano Barium Sulfate is continuously produced in a patented MicroJetReactor (MJR®)
Benchmarking shows Key Advantages

Comparison of particle sizes of Disbarit® nano vs. a conventional BaSO₄ dispersion additive

Normalized particle size distribution

- Milled and dispersed BaSO₄
- MJR precipitated BaSO₄
Advantages of *Disbarit® nano* Approach

Reduced milling time: From 12 – 24 h down to 2 – 4 h

Reduced milling additives: > 90 %

Reduced dispersion agents: > 90 %

Reduced wetting additives: > 50 %

Sedimentation stability: > 6 months at 60°C

Improved stabilization of pigments: Higher optical density
  - Either reduced pigment concentration
  - Or better optical performance
Car Paints

Example: Printex U Carbon Black paste

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<th>Conventional</th>
<th>Disbarit® nano</th>
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<tr>
<td>Process time</td>
<td>2 to batch &gt; 40 hours</td>
<td>5 to batch 10 – 20 hours</td>
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<tr>
<td>Color strength</td>
<td>100%</td>
<td>110 – 130 %</td>
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<tr>
<td>Particle Size</td>
<td>&lt; 5 µm</td>
<td>&lt; 1µm</td>
</tr>
<tr>
<td>Resin</td>
<td>10 – 20 %</td>
<td>None</td>
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<td>One paste per resin</td>
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Architectural Paints

Example: TiO$_2$ Slurries

**Conventional Approach**

- Only for architectural paints
- Polyacrylate stabilization
- Every application requires own slurry

**Disbarit® nano Approach**

- Flexible for all applications
- No sterical additive
- One fits all!
Filler Slurries

Example: Talcum, BaSO$_4$, CaCO$_3$ Slurries

**Conventional Approach**

- Sterical additive
- Sedimentation vs. price

**Disbarit® nano Approach**

- Sterical additive-free
- No sedimentation – cost reduction
## Clear Advantages of Disbarit® nano

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Summary

Substitution of sterical and electrostatic stabilization through electrosterical stabilization

- Use of solid particles as spacers

Chemical versatility through application of *Disbarit® nano* particles

Innovative unique continuous MJR® - based production

- Highly homogeneous reproducible dispersion additive

Application versatility in many product areas
Disbarit® nano Approach: Disruptive!

Today: 3500 dispersion and wetting additives

Disbarit® nano: One fits for all applications

Significant less side effects – 50 % shorter time-to-market

New color production process with significant benefits

- Much shorter process times
- Reduced process costs
- Higher product performance