nanoSaar

BARISOL

Next Generation Spacer Technology for Paints & Coatings

August 2020





nanoSaar

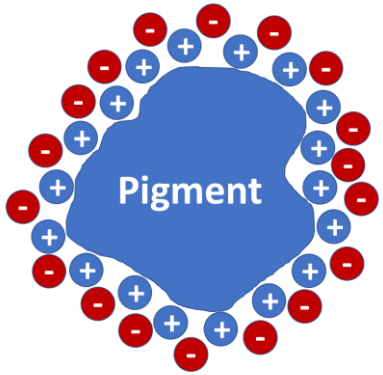
Today: >3,500 dispersion and wetting additives for automotive, architectural, inkjet and coil coatings

The Challenge

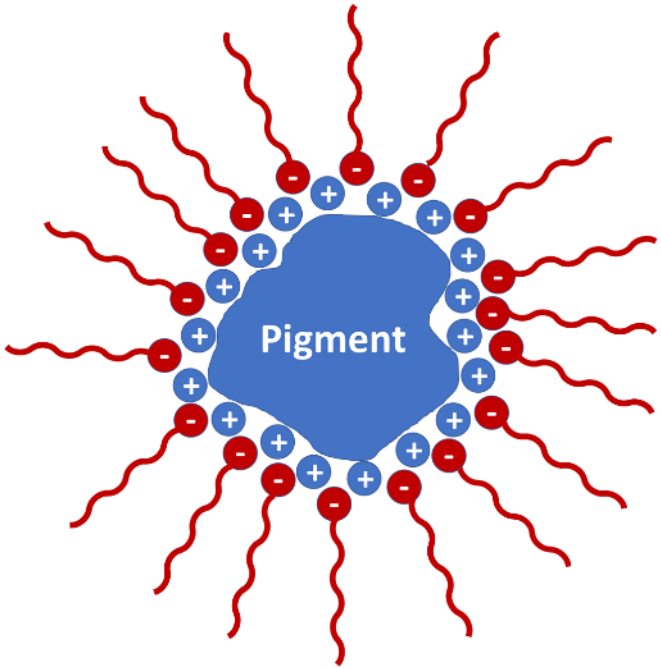
Achieve pigment stabilization while drastically reducing the concentration of organic dispersion/wetting additives and all negative side effects in the product

Conventional Dispersion Additives

Electrostatical Stabilization



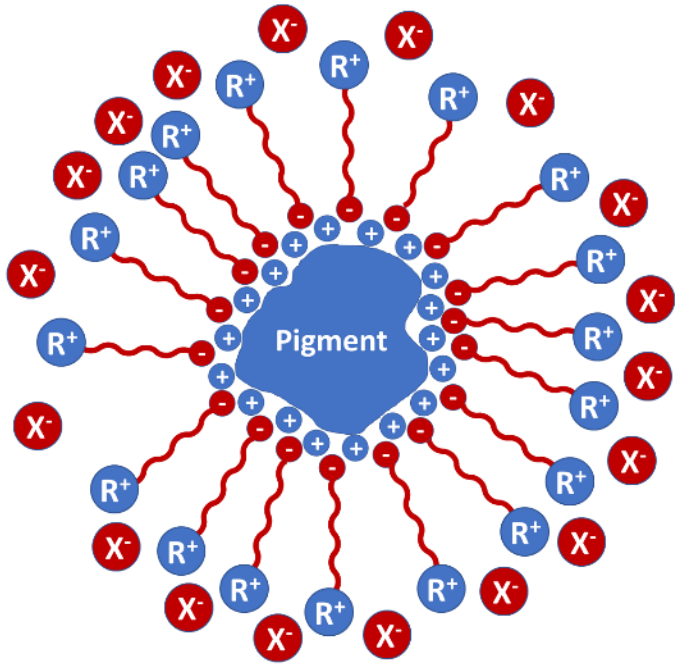
Sterical Stabilization



Different Dispersion Additives in Comparison

Dispersion Additives	Absorption on Pigments Inorganic	Absorption on Pigments Organic	Stabilization Efficiency	Viscosity Reduction	Water Sensitivity	Foaming Tendency	Binder Compatibility	Cost
Polyacrylates	good	no	good	good	very high	fair	very poor	low
Phosphonates	good	no	good	good	very high	fair	poor	low
Hydrophobic mod. Polyacrylates	good	no	good	good	high	higher	poor	medium
Nonionic "Surfactans"	good	good	good	good	medium	very high	good	medium to low
Ionic "Surfactants" (Sulfates, Phosphates)	good	fair	good	good	medium	high	fair	medium
Dream?	good	good	good	good	very low	very low	good	low

Potential Solution: Electrosterical Stabilization



Dispersion Additives	Absorption on Pigments Inorganic	Absorption on Pigments Organic	Stabilization Efficiency	Viscosity Reduction	Water Sensitivity	Foaming Tendency	Binder Compatibility	Costs
Polymeric Electrosteric Active Dispersants	good	good	good	good	low	high	depends	high

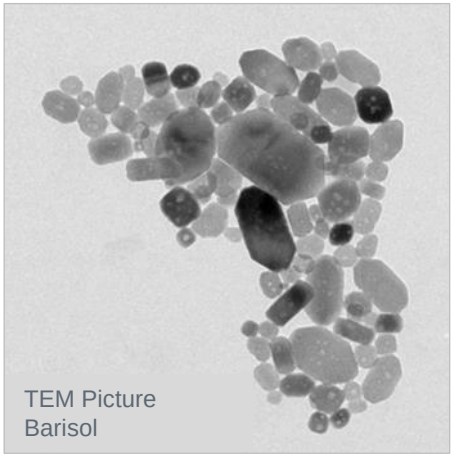
Solution: Substitution of Organic Additives by Electrosterically stabilizing Particles

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 = Barisol

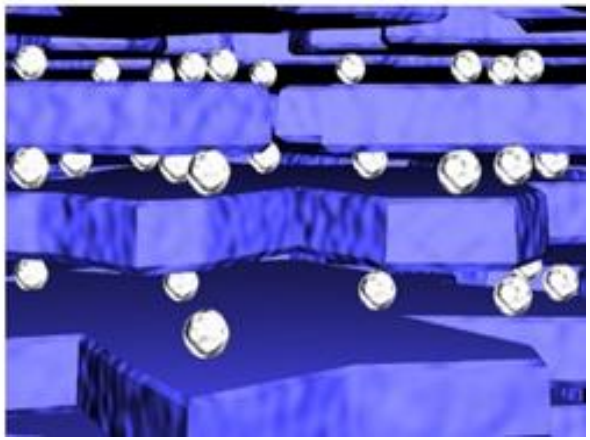


TEM Picture
Barisol

Nanoparticles as Physical Spacer

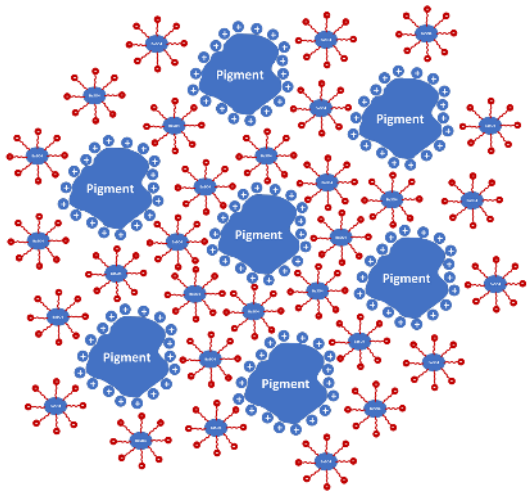
Barisol particles move between pigments as spacers – physically preventing sedimentation/agglomeration of pigment particles

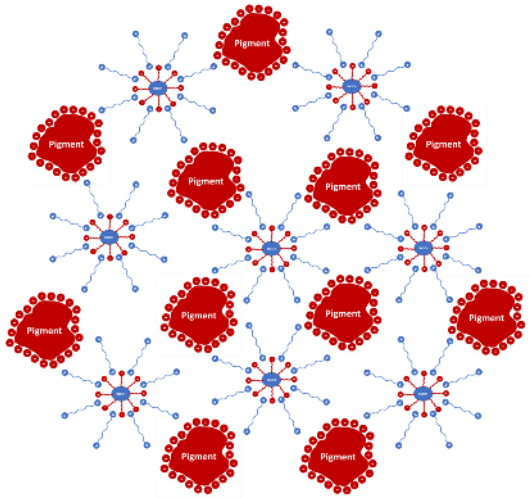
- Electrosteric stabilization at typical coating pH of 4 – 11
- Without influencing water resistance of dried film
- Without causing foam or polymer-incompatibility with different binder systems



Positive Effects of Barisol

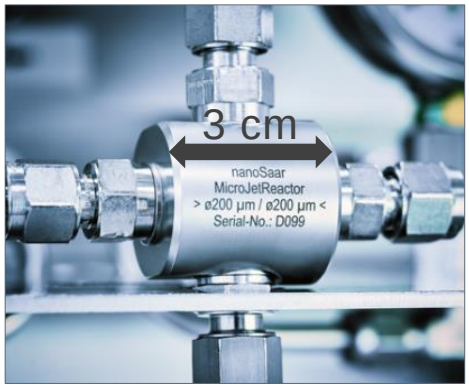
- Robust pigment stabilization
- Avoidance of flocculation and sedimentation
- Higher deagglomeration efficiency
- Additive cost reduction
- Color strength increase
- Viscosity reduction
- Process cost reduction
- VOC Reduction

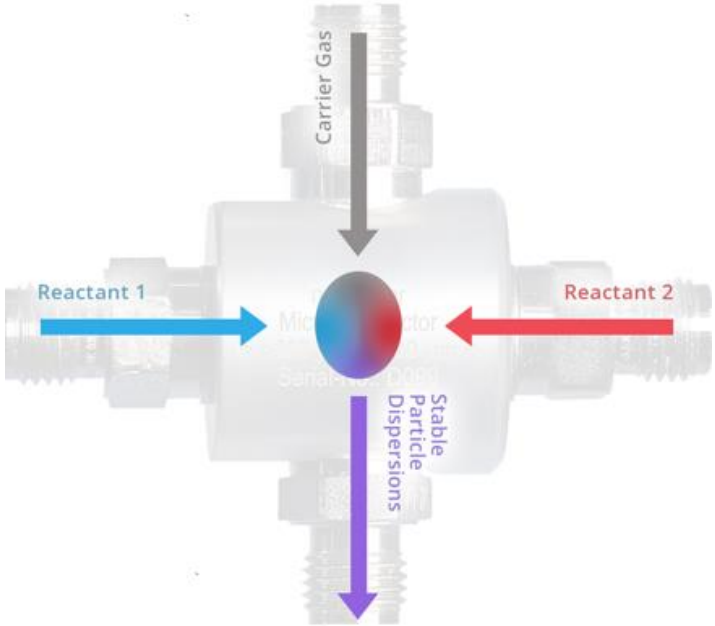




Innovative Production of Barisol

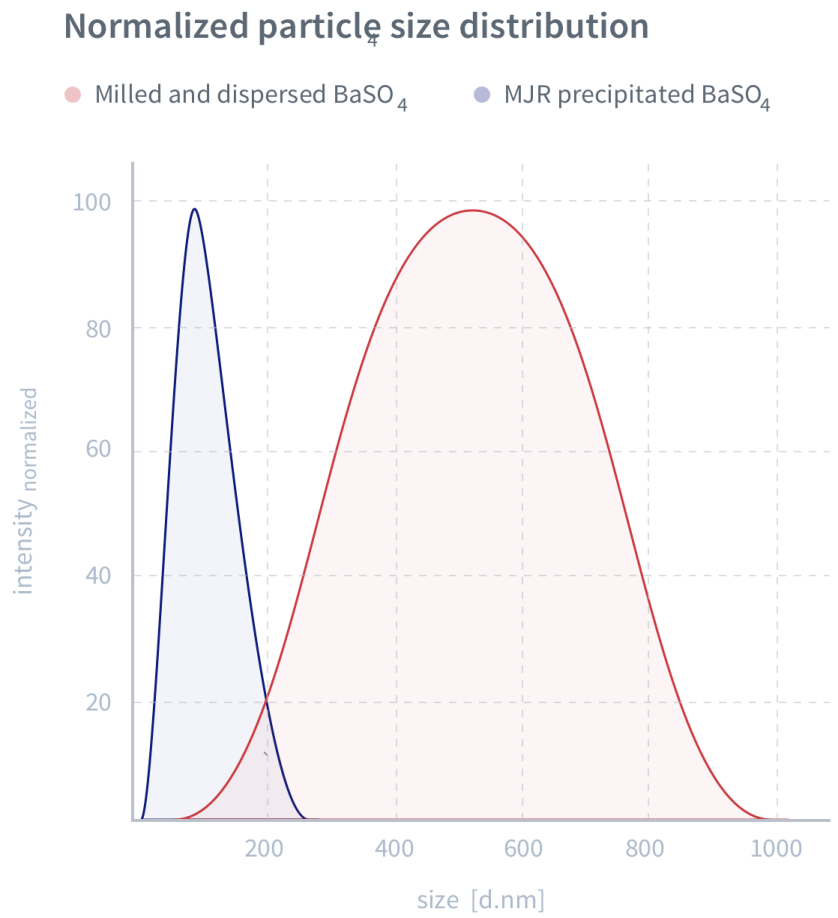
nano Barium Sulfate is continuously produced in a patented MicroJetReactor (MJR®)





Benchmarking shows Key Advantages

Comparison of particle sizes of Barisol vs. a conventional $BaSO_4$ dispersion additive



Advantages of Barisol 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^{o} C
VOC:	< 10 % (in some cases < 5 %) due to better Pigment distribution
Improved stabilization of pigments:	Higher optical density

Car Paints

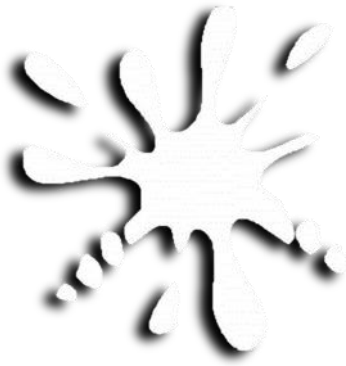
Example: Printex U Carbon Black paste

Approach	Conventional	Barisol
Process time	2 to batch > 40 hours	5 to batch 10 – 20 hours
Color strength	100%	110 – 130 %
Particle Size	< 5 µm	< 1µm
Resin	10 – 20 %	None
	One paste per resin	One fits all!

Architectural Paints

Example: TiO_2 Slurries

Conventional	Barisol Approach
Only for architectural paints	Flexible for all applications
Polyacrylate stabilization	No sterical additive
Every application requires own slurry	One fits all!



Filler Slurries

Example: Talcum, $BaSO_4$, $CaCO_3$ Slurries

Conventional	Barisol Approach
Sterical additive	Sterical additive-free
Sedimentation vs. price	No sedimentation – cost reduction

Color Cards

Clear Advantages of Barisol

Dispersion Additives	Absorption on Pigments Inorganic	Organic	Stabilization Efficiency	Viscosity Reduction	Water Sensitivity	Foaming Tendency	Binder Compatibility	Cost
Polyacrylates	good	no	good	good	very high	fair	very poor	low
Phosphonates	good	no	good	good	very high	fair	poor	low
Hydrophobic mod. Polyacrylates	good	no	good	good	high	higher	poor	medium
Nonionic "Surfactans"	good	good	good	good	medium	very high	good	medium to low
Ionic "Surfactants" (Sulfates, Phosphates)	good	fair	good	good	medium	high	fair	medium
Polymeric Electrosteric Active Dispersants	good	good	good	good	low	high	depends	high
Barisol	good	good	good	good	very low	very low	good	low

Broad Application Opportunities

- Automotive coatings
  - Fillers
  - Base coats

- Architectural coatings
  - Decorative paints interior
  - Protective / decorative paints exterior

- Inkjet printing

- Coil coating

Not yet

Barisol Approach: Disruptive!

- Today: > 3500 dispersion and wetting additives
- Barisol: One fits for all applications (high versatility)
- Significant fewer side effects
- 50 % shorter time-to-market
- Improved Economics
- Lower VOC

- New color production process with significant benefits:
  - Much shorter process times
  - Reduced process costs
  - Higher product performance

nanoSaar AG

Würmstrasse 4
82319 Starnberg
Germany

Dr. Michael Steiner
CEO

Phone: +49 8151 9590 221
Mobile: +49 176 6164 7872

m.steiner@nanosaar.com