Coatings Trends & Technologies SUMMIT

Revolutionizing Antistatic Additives Development of a Renewable Solution with Improved Toxicological Profile for Coating and Adhesive Applications

Clariant
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BU Adsorbents & Additives is a global, diversified solution provider

Advanced Surface AddWorks
We offer advanced wax and polymer AddWorks that protect and enhance surfaces in plastics, coatings & inks, adhesives, agro and care applications.

Passive Fire / Flame Retardants
Our patented halogen-free flame retardants provide environmentally compatible fire protection and pass demanding fire safety standards.

Performance Additives
Our performance additives AddWorks prevent oxidation, dissipate electric charge accumulation and improve heat, light and weather resistance.

Plastics

Coatings & Inks

Adhesives & Sealants

~ 920
Employees

8
Production Sites

4
Technology Centers

3
Innovation Centers

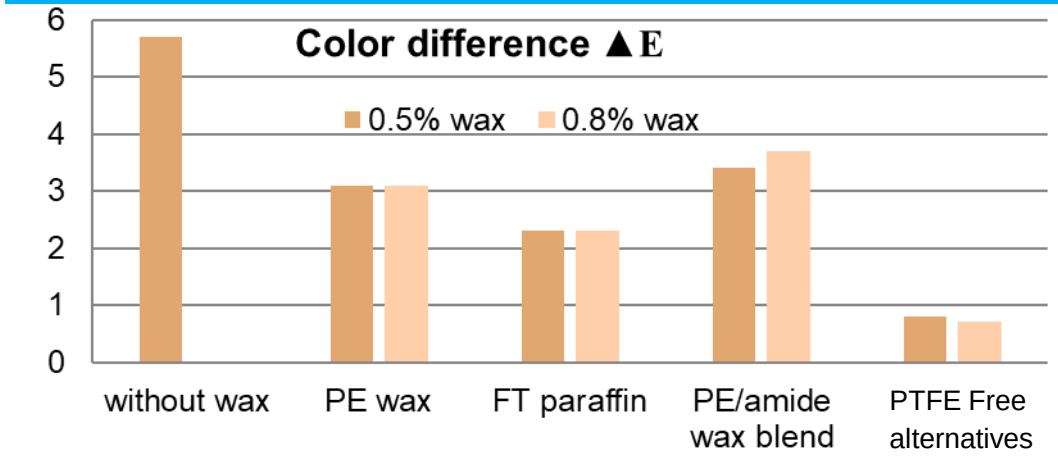
General market trend toward safer chemicals

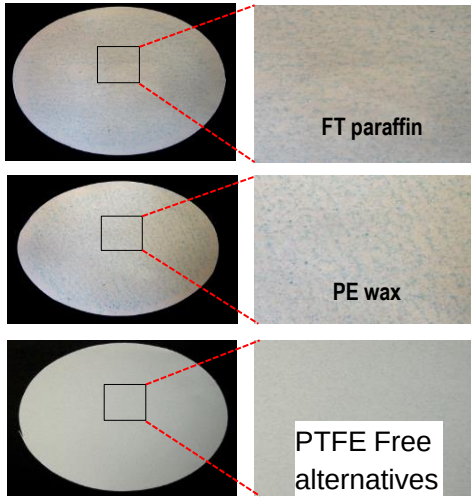
The main reasons for the general trends toward safer raw materials in coatings and inks include:

- **Regulatory compliance**
  - Governments worldwide have implemented stricter regulations on the use of hazardous materials in various industries, including coatings and inks.
- Health and safety concerns
- Environmental impact and reduced pollution
- Increasing consumer demand for safer and sustainable products
- Improved worker well-being and productivity
- Technological advancements and innovation
- Liability reduction
- Enhanced supply chain resilience
- Improved brand image and reputation
- Alignment with global sustainability goals

Possibilities or PTFE free waxes for coatings and inks

Color difference after 50 rub cycles



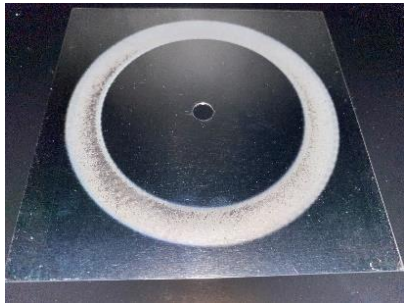


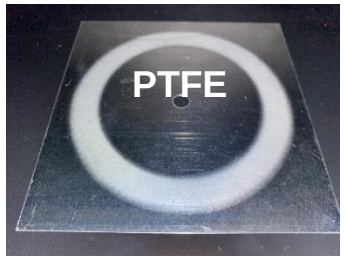
Conditions valid for all data:
wax content 0.5 / 0,8%; 50 cycles after 24h; 6µm wet film; loading 48 g/cm²

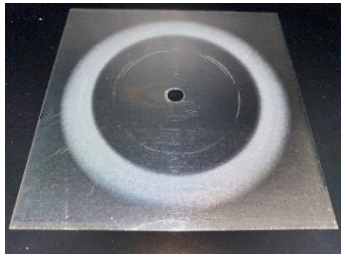
Lowest ▲E values

No color transfer to test paper

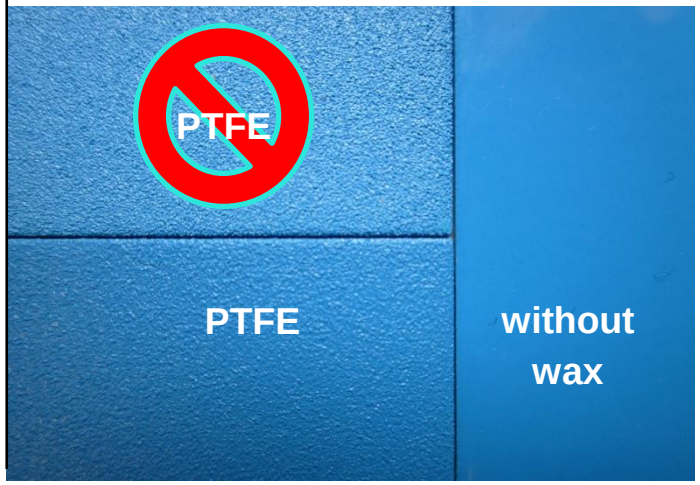
Without wax







PTFE free alternative in metal packaging



PE MA Waxes for PTFE-free structured powder coatings

Metallocene based, chemical modified PE wax

Why need of antistatic additives in coating & how they work

Antistatic additives are necessary for coatings because the buildup of static electricity on the surface of a coating can cause various issues such as:

- ✓ processing problems
- ✓ safety hazards
- ✓ electrical defects

Antistatic additives work by:

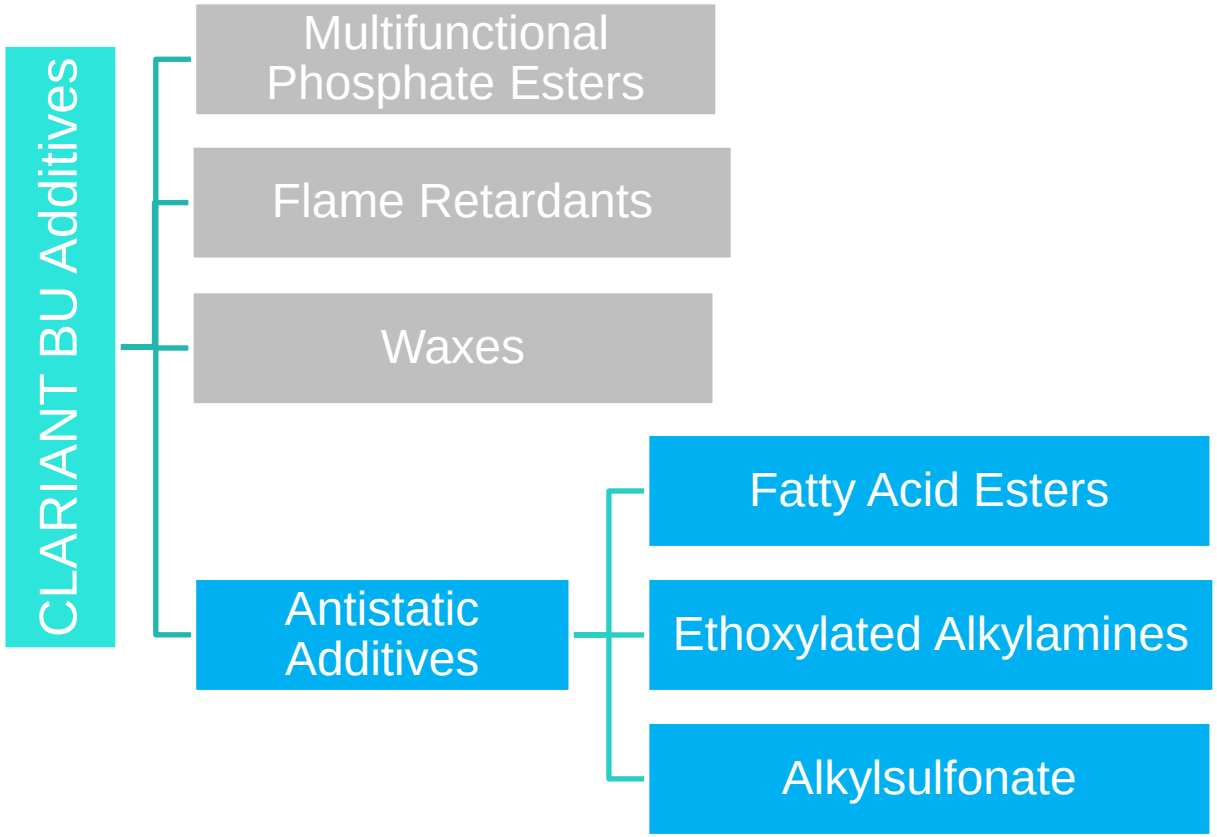
- ✓ enhancing the conductivity of the coating
- ✓ allowing the charge to dissipate quickly and safely

→ which prevents the accumulation of static electricity and the associated problems.

Additional benefit of antistatic additive:
antistatic coatings can protect sensitive electronic equipment from electrostatic discharge (ESD) damage
→ prevent costly repairs or permanent damage.

Conclusion:
The use of antistatic additives in coatings is essential to ensure safe and efficient processing and handling of materials and equipment, particularly those that are prone to static buildup.

Main antistatic additives chemistry in coatings & inks



Quaternary Ammonium Compounds:

- Include quaternary ammonium compounds in coatings and inks.
- Form a thin, conductive layer on the surface of the substrate.
- Examples: Tetrakis(hydroxymethyl)phosphonium chloride (THPC) derivatives.

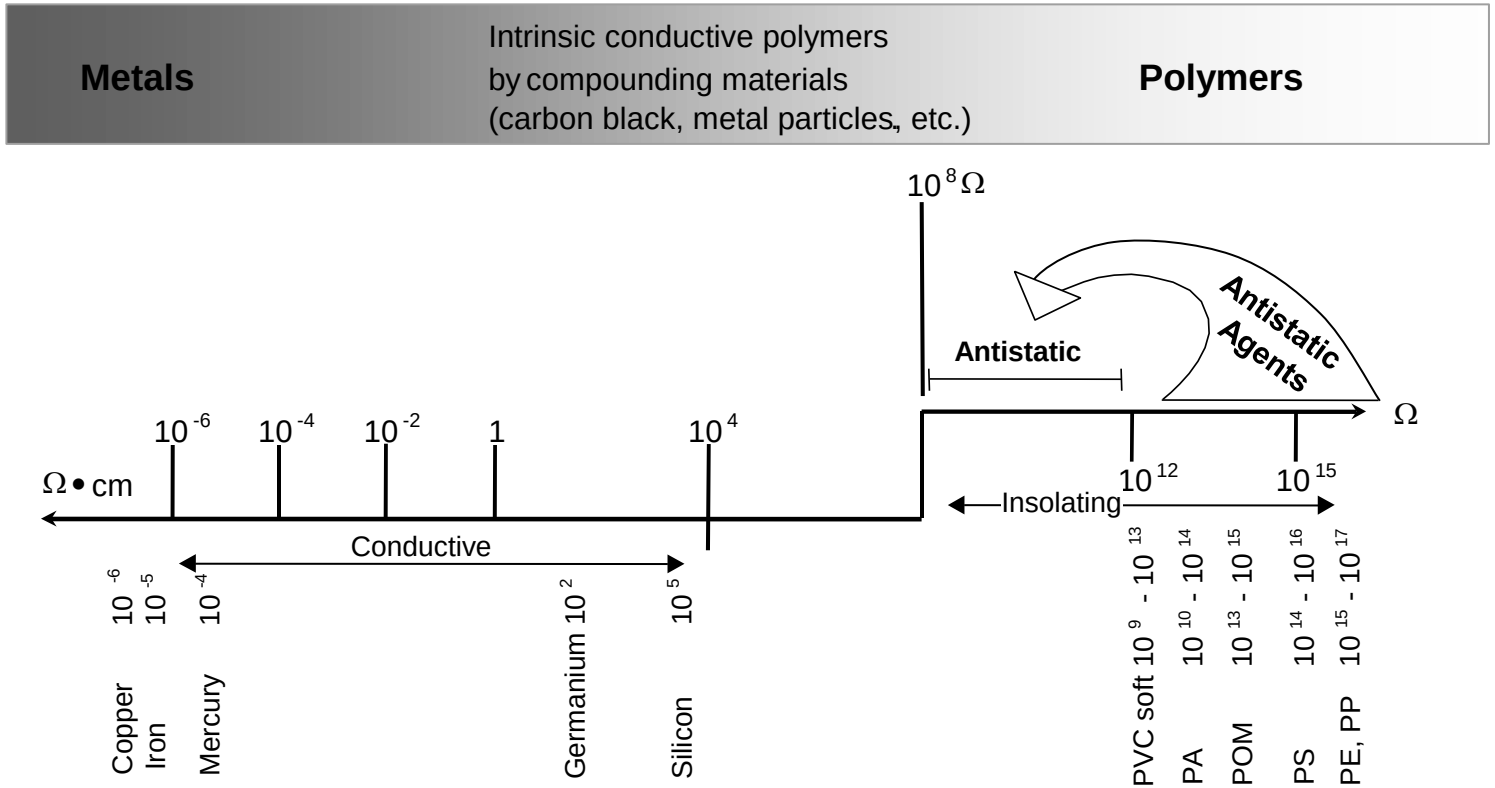
Surfactant-Based Additives:

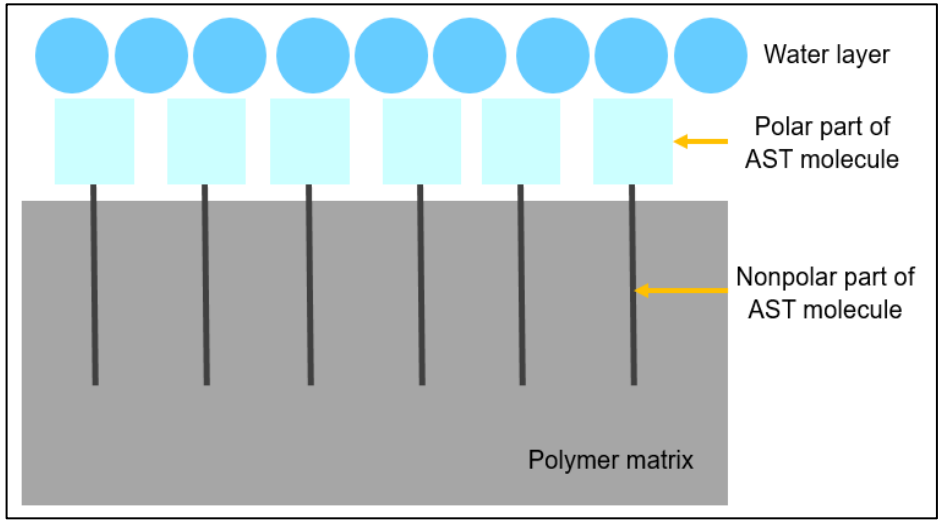
- Utilize surfactants as additives in coatings and inks.
- Reduce surface tension and enhance charge dissipation.
- Form a conductive layer on the coated material.

Polymeric Additives:

- Mix polymeric additives into coatings and inks.
- Improve antistatic characteristics without altering the base material significantly.
- Examples: Polyethylene glycol, polypropylene imine.

Conductivity of Raw Materials
Specific Resistance (R) in [Ω •cm]
Surface Resistance (R_0) in [Ω]

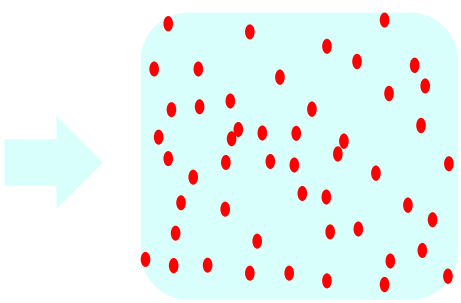




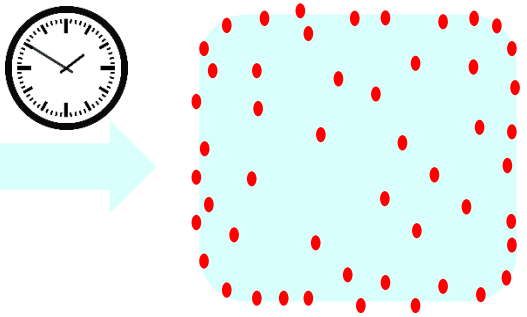
Conceptual Model of Intrinsic Antistatic Agents

Model for internal AST

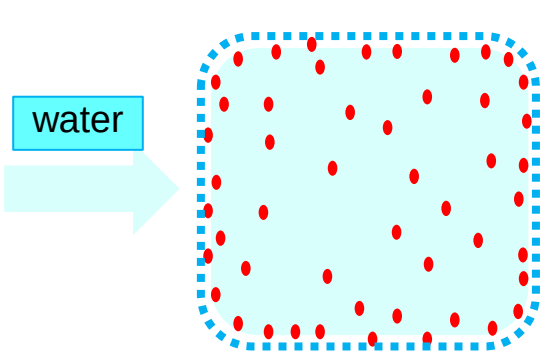
Formulation – Application
Homogeneous distribution of AST in coating



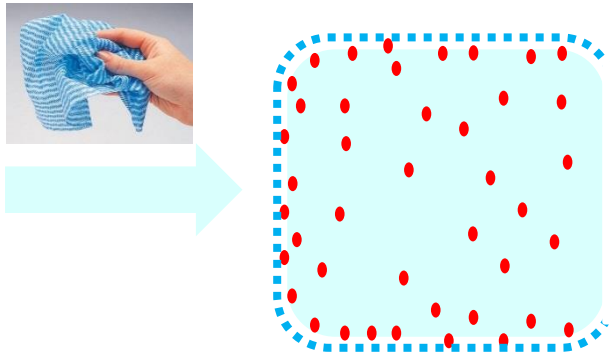
AST evenly distributed in coating



AST Migrated to surface



Water on surface



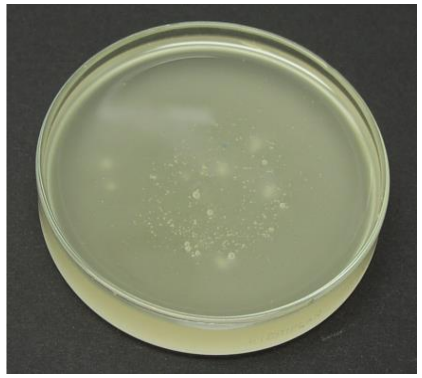
AST effect destroyed

Migration depends on
- time
- molecular weight
- polarity
- polymer (TG)

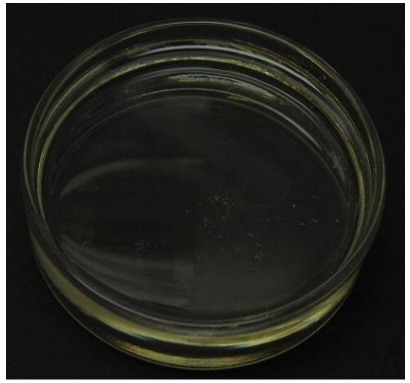
Visual Characteristics of Antistatic Additives

olefin glycerol
OG

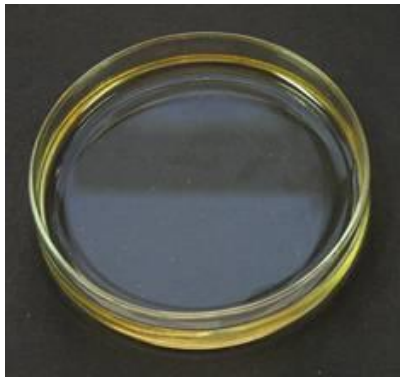
fatty ester ethoxylated
FE



alkyl amine
AA 1& 2



fatty amine
FA

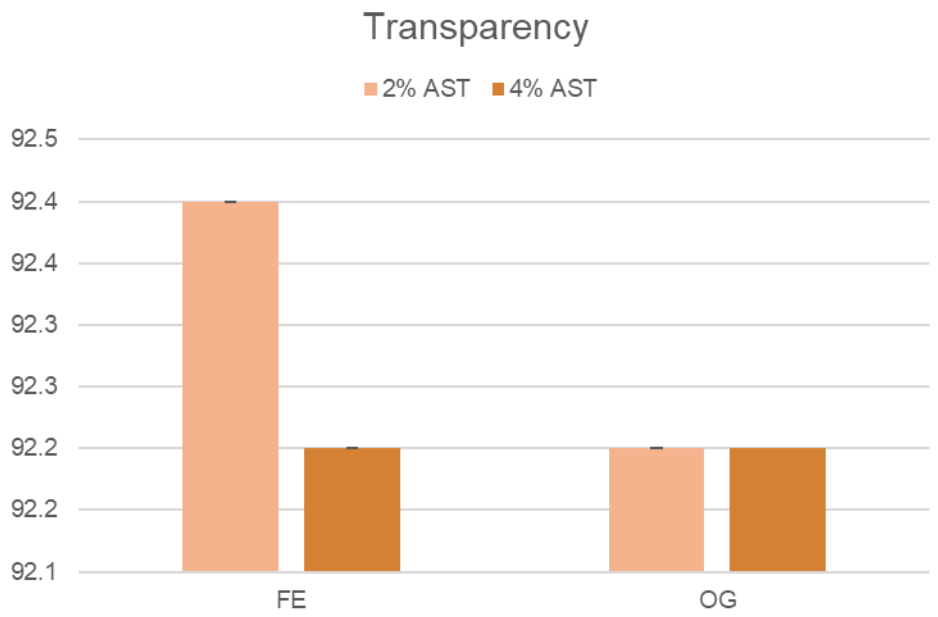


alkyl amine
AASO4

Evaluation in a waterborne acrylic coating

% AST	Sample	Surface Resistance (R_0) in [Ω]
-	No Additive	4.16E+12
0.5% and 2%	AA1	
	AA2	
	AASO4	
0.5	FE	3.18E+11
2.0		1.31E+10
0.5	OG	2.66E+11
2.0		1.30E+09

Amine based AST not compatible

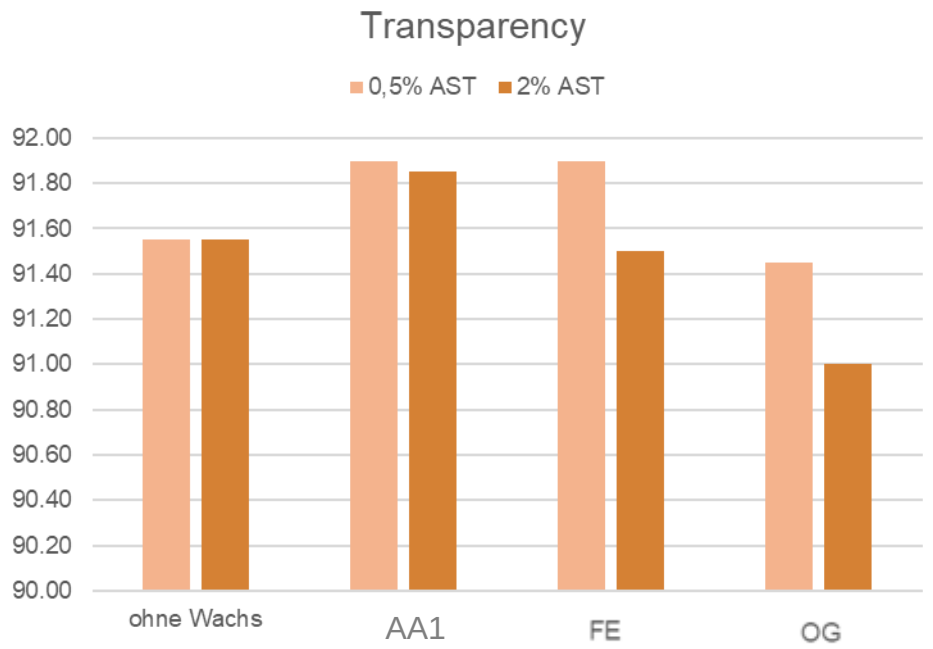


- ✓ **Excellent antistatic effect**
- ✓ **Excellent transparency**

Evaluation in a solventborne 2K PU coating

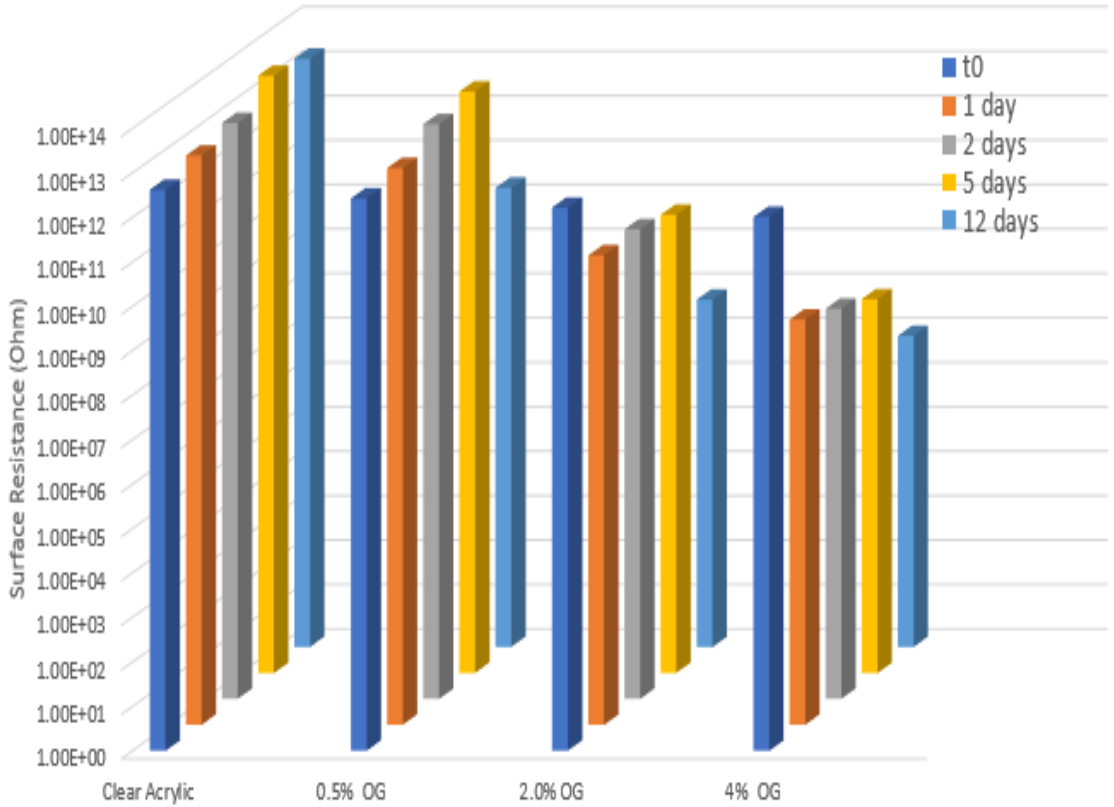
% AST	Sample	Surface Resistance (R_0) in [Ω]
-	No Additive	6.25E+13
0.5	AA1	1.11E+14
2.0		2.47E+13
0.5	AA2	5.47E+13
2.0		1.11E+14
0.5	AASO4	
2.0		
0.5	FE	3.92E+13
2.0		4.27E+13
0.5	OG	4.43E+11
2.0		1.32E+10

AASO4 not compatible



- ✓ **AST OG Excellent antistatic effect**
- ✓ **Excellent transparency**

Surface resistivity overtime in 2K SB clearcoat apply on engineer plastic substrate



Initial Decrease: When you initially add an antistatic additive to a material or surface, the surface resistivity often decreases. This is because the additive helps to disperse and neutralize static charges, making the material less insulative.

Over Time:

- ❑ At first, the surface resistivity will continue to decrease as more AST gets to the surface
- ❑ Over an extended period, the surface resistivity can start to increase. This can be due to several factors:
  - ➢ Contamination: The material's surface may accumulate dust, dirt, or other contaminants, reducing the effectiveness of the antistatic additive.
  - ➢ Wear and Tear: Mechanical wear and abrasion can also affect the performance of the antistatic additive and cause an increase in surface resistivity.
- ❑ Then the surface resistivity will start to decrease as more AST gets to the surface from the coating

Conclusion
Enhancing Antistatic Performance with Amine-Free Additives

- The additives OG (olefin glycerol) and FE (Fatty ester ethoxylated) are groundbreaking amine and amide-free antistatic solution
- OG is derived from renewable resources, emphasizing Clariant's commitment to sustainability
- OG is non-toxic and minimizing environmental impact
- Rapid action, versatile in broad range of coatings and inks usage (including waterbased and solvenbased)
- Enhancing antistatic performance with amine-free additives

Thank you!
Please feel free to outreach for any technical support

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