ELEMENTIS

A global specialty chemicals company

Application Leaflet

DAPRO® FK 321

Resistance reducing agents for non-aqueous electrostatic spray coatings

Key Benefit

- Effective coatings electrostatic resistance reduction

Introduction

The electrostatic resistance of coatings have a tremendous influence on the application properties of electrostatic spray coatings. The electrostatic spray technique is based upon the fact that charges of unequal electrical polarity attract one another. The spray paint is given a high electrical charge. Atomized paint particles are attracted to an earthed substrate. The coating follows the electrical field lines to the area of the lowest electrical resistance (*Figure 1*).

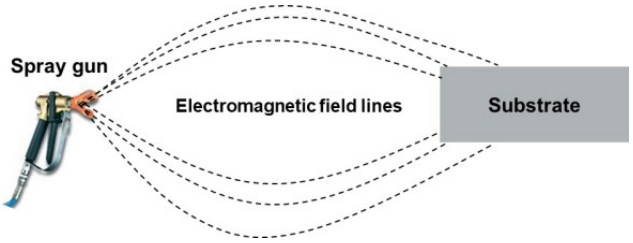

Figure 1: Electromagnetic field lines

Ideal resistance values of the coatings are in a range of larger than 500-600 Kilo Ohm (K.Ohm). The upper limit need to be evaluated individually, however, should generally not exceed 1.8-2.0 Mega Ohm (M.OHm).

Higher, correctly adjusted, electrical resistance of the coating is typically moving the field lines towards non-coated substrate metal. In this case the coating process is constantly moving forward.

Lower resistance rates are moving the coating stream away from the substrates edges. In this case, the layer thickness of the applied coating is increasing constantly. However, also the risk of sagging rises in such cases. Further, too high resistances are causing the risk of transmitting high electrical charges, up to the emmittation of sparks.

Electrical resistance reduction

The options to increase the resistance is usually limited. In general in such cases the concentration of highly polar solvents and ions should be minimized. However, the polarity of Xylene is already often high enough to reduce the resistance.

The main influence of the coatings resistance is the choice of the binder. Higher loadings of remaining monomer might have an influence as also surfactants and solvent in the binder.

In case of too high electrical resistance, a reduction is utilized by a partial replacement of non-polar solvent, e.g. aliphatic or aromatics, by polar solvents, such as alcohols, ketons and esters (*Figure 2*). Alternatively, an increase of the concentration of ions or soluble parts of extenders and pigments is a suitable option.

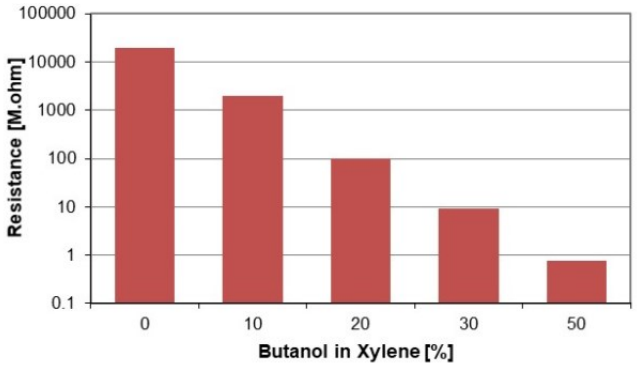

Figure 1: Resistance reduction using Butanol

As shown in the graph, with increasing content of Butanol a constant decline of the electrical resistance can be detected.

However, the dosage of the Butanol usually needs to be quite high. The most effective way to reduce the coatings resistance is the use of an agent like DAPRO® FK 321.

DAPRO® FK 321 has been based on a quaternary ammonium composition and effectively reduces the electrostatical resistance without further formulatory alterings.

Chemical and physical data

Composition	Quaternary ammonium component in isobutanol
Appearance	Clear liquid
Active content [%]	75
Ionic character	Cationic
Density [g/cm³]	ca. 0.94

When adding DAPRO® FK 321 to the same formulation, the resistance drop significantly stronger already from signifincantly lower loadings (*Figure 3*).

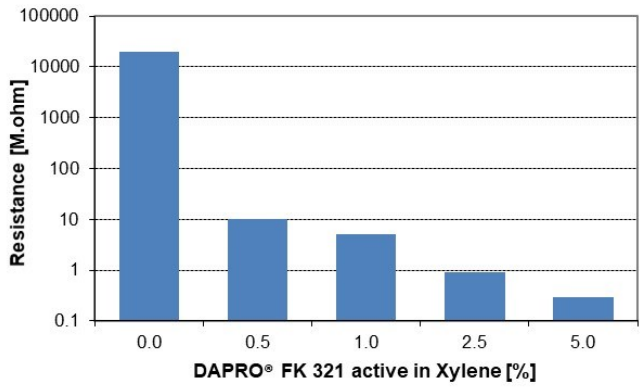

Figure 3: Resistance reduction using Butanol

Polyester melamine coating

In addition to the data generated in the pure solvent, DAPRO® FK 321 has also been tested in a commercially available polyester melamine coating. The coating was equipped with varios loadings of DAPRO® FK 321 in order to identify the minimum concentration to reduce the electrostatical resistance to a level of below 1000 K.Ohm (Figure 4).

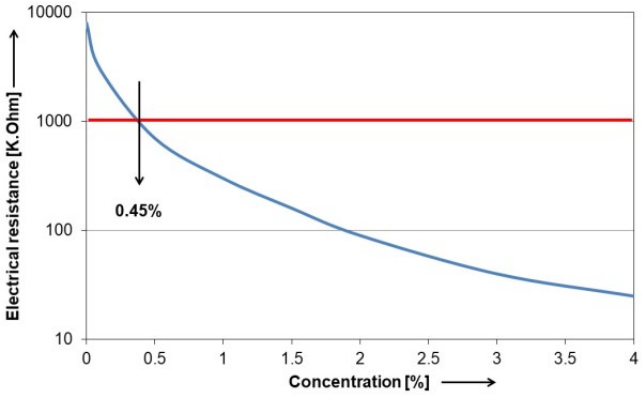

Figure 1: Resistance polyester melamine coating

Already from concentrations of below 0.45%, the electrostactic resistance could be reduced to levels of below 1000 K.Ohm.

However, also the influence of other paint parameters such as viscosity, gloss and grade of whiteness have been investigated (*Result table below*).

Sample	Viscosity [mPas]	Gloss at 60° [units]	Whiteness
Blank	702	93	79.5
1.5% DAPRO® FK 321	793	92	77.8

Result table: Further coatings parameter

The use of DAPRO® FK 321 has no influence on the systems gloss. However, at the shown higher concentration of 1.5% a slight increase of the systems viscosity can be observed. Also a minor reduction of the whiteness grade can be detected.

Conclusion

DAPRO® FK 321 provides efficient reduction of the resistance excellent of electrostatically applied spray paints. Other paint parameters are only minorly affected.

Appendix

Test methods

Brookfield viscosity

Measured by the Brookfield DV riscometer, equipped with spindle 5, at a temperature of 23°C.

Gloss

Gloss determined using the Byk Gardner Haze/Gloss tester at a measuring angle of 20°.

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North America
Elementis
469 Old Trenton Road
East Windsor,
NJ 08512, USA
Tel:+1 609 443 2500
Fax:+1 609 443 2422

Europe
Elementis UK Ltd.
c/o Elementis GmbH
Stolberger Strasse 370
50933 Cologne, Germany
Tel:+49 221 2923 2066
Fax:+49 221 2923 2011

Asia
Deuchem (Shanghai) Chemical Co., Ltd.
99, Lianyang Road
Songjiang Industrial Zone
Shanghai, China 201613
Tel:+86 21 5774 0348
Fax:+86 21 5774 3563