

STAPA®

金属效果铝浆

Aluminium Pigment Pastes for Metallic Effects

技术资料

Technical Information

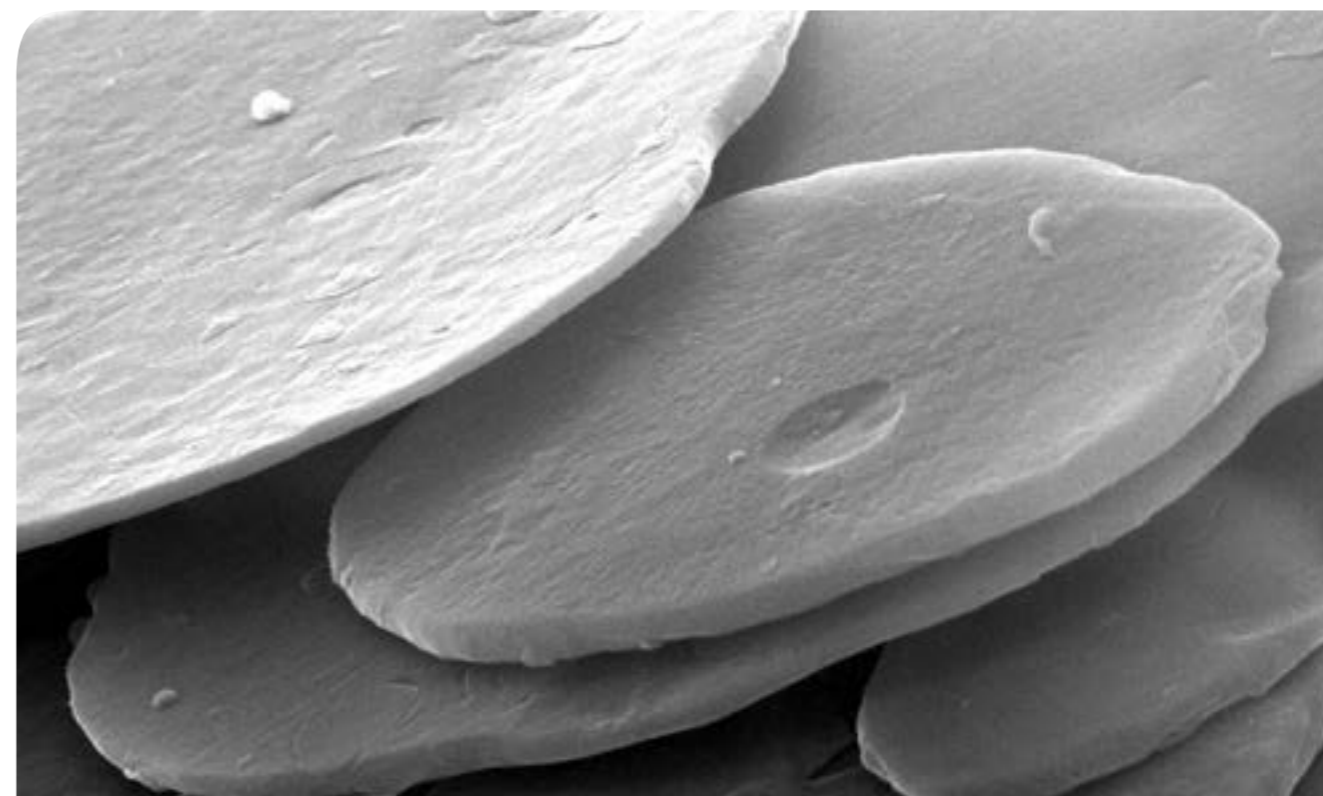
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金属效果颜料 *Metallic Effect Pigments*

金属效果颜料应用于涂料当中,不但可以获得漂亮的金属外观,还可以达到某些独特的功能。金属效果颜料往往呈片状,颗粒直径比一般彩色颜料的大。普通颜料的直径通常都在可见光的波长范围内,而具有特殊金属效果的片状颜料的直径一般约在 5 – 45 µm 之间。

Metallic effect pigments are used in the paints and coatings industry for both their optical effects as well as for their functionality. Effect pigments are always lamellar (flakes) and their particle diameter is larger than the one of colour pigments. While the particle size of colour pigments is in the wavelength range of visible light, the flake diameter of effect pigments is generally around 5 – 45 µm.



生产工艺

Production Process



许多情况下，金属颜料的各种特性都可由生产工艺决定。目前铜金粉都是在球磨机中 (Hametag工艺) 干法研磨而成。而鉴于安全原因，现代的铝颜料都采用 Hall 工艺在溶剂中湿法研磨。

先将原料进行熔融喷雾，得到纯度不低于 99.5% (按照EN 576标准) 的不规则喷雾粉。然后经注入了润滑剂的球磨机研磨成片状颗粒。

研磨的参数和润滑剂的种类由颜料的最终用途决定。研磨后得到的颜料浆再经筛分、压滤和混合后，得到固体份为 65%，溶剂为 35% 的标准颜料浆。

通过添加特定的溶剂，或在滤饼中加入助剂，可以按照不同的应用来定制合适的颜料浆产品。

In many cases the properties of metallic effect pigments can be deduced directly from the production process. The gold bronze pigments are dry milled in ball mills (Hametag process), but for safety reasons aluminium pigments are produced almost exclusively in a wet milling process adding white spirit (Hall process).

The raw material - atomized, spattered aluminium with a minimum purity of 99.5% according to EN 576 – is milled respectively shaped to flake-like particles in ball mills, filled with grinding aids (lubricant).

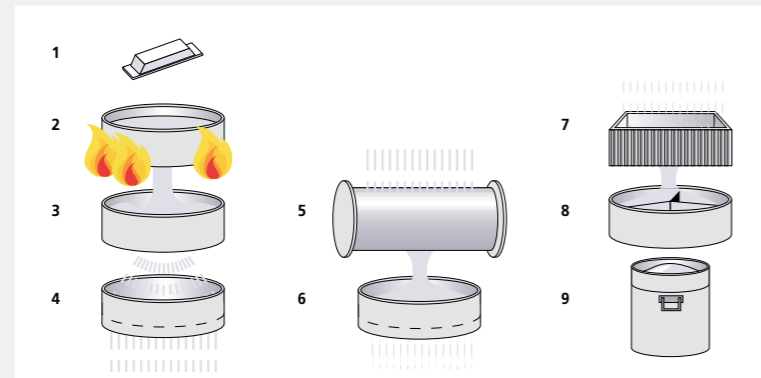
The milling parameters and the lubricant are determined by the application for which the pigment is intended. The pigment slurry is screened, pressed on filter presses and adjusted in mixers to a ratio of 65% solids and 35% solvent.

The final product can be tailor-made for its later application by the addition of particular solvents or additives to the filter cake.

生产流程 / Production Process

图 1 / Fig. 1

- 1 铝 / AL min. 99,5 % DIN 1712
- 2 熔融 / Melting
- 3 雾化 / Atomizing
- 4 筛分 / Sieving
- 5 球磨 / Ball mill
 - 溶剂 / Mineral spirit
 - 润滑剂 / Lubricant
- 6 筛分 / Sieving
- 7 压滤 / Filterpress
- 8 混合 / Mixer
- 9 STAPA® 铝浆 / Aluminium paste



产品系列一览

Overview of Product Series

STAPA® METALLIC

粒径分布宽，遮盖力好，色彩强烈，细粒径型号略呈灰相

STAPA® MOBILUX

粒径分布窄，色纯度高，色相清晰

STAPA® METALLUX 200

粒径粗，粒径分布极窄，色相清晰的闪烁效果

STAPA® METALLUX 600

粒径分布较宽，粒径细，遮盖力很好，细粒径呈灰相

STAPA® METALLUX 700

适用于罐听涂料和卷钢涂料

STAPA® METALLUX 1000

集高着色力 / 遮盖力和强闪烁感于一身，金属感强

STAPA® METALLUX 1500

高金属感银元型，出众金属效果，独特的遮盖力

STAPA® METALLUX 2000

标准银元型，粒径分布窄

STAPA® METALLUX 3000

银元型，粒径分布极窄，高金属感，色纯度高，随角异色性强

STAPA® METALLUX 4800

亮白银元型，所有角度呈亮白

STAPA® METALLUX 8000

粒径细，粒径分布窄，色泽清晰

STAPA® METALLUX 9000

丝光型，亮白而细，随角异色性低，丝光亮白色泽

NDF

片状，耐剪切，各粒径规格齐全，色泽非常清晰

ALOXAL®

香槟色铝颜料，循环管线内稳定性好，耐剪切性优秀，暖调金属效果

STAPA® METALLIC

Wide particle size distribution, good hiding power, intensive colour, especially the fine grades are slightly greyish

STAPA® MOBILUX

Narrow particle size distribution, high colour purity, for clear colour shades

STAPA® METALLUX 200

Coarse sparkle grade, very narrow particle size distribution, for clear colour shades with sparkle effect

STAPA® METALLUX 600

Comparatively wide particle size distribution, fine, very good hiding power, greyish in fine grades

STAPA® METALLUX 700

Aluminium pigment pastes for can and coil coatings

STAPA® METALLUX 1000

Tinting strength / hiding power and sparkle effect in one pigment, high brilliance

STAPA® METALLUX 1500

Highly brilliant silverdollar, pronounced metallic effect, unique hiding power

STAPA® METALLUX 2000

Standard silverdollar, narrow particle size distribution

STAPA® METALLUX 3000

Silverdollar, very narrow particle size distribution, high brilliance and colour purity, dark flop

STAPA® METALLUX 4800

White silverdollar, bright over all angles

STAPA® METALLUX 8000

Fine, narrow particle size distribution, for clear colour shades

STAPA® METALLUX 9000

Silky gloss grades, very bright and fine, low flop, for silky gloss and bright colour shades

NDF

Non-degrading flakes, high shear stability, all finenesses, for very clear colour shades

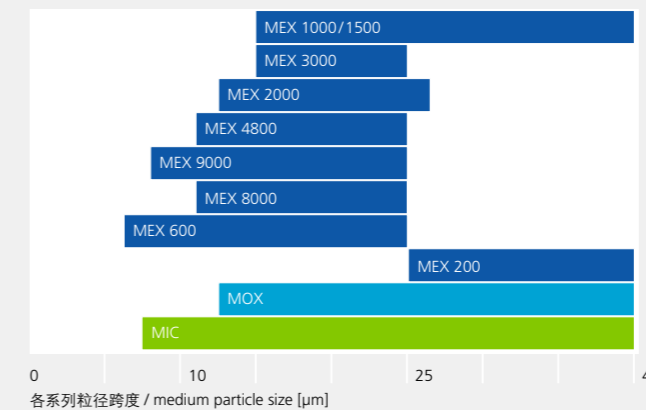
ALOXAL®

Champagne coloured aluminium pigments, stable in circulation lines and high shear stability, deep and warm metallic effects

STAPA® METALLIC / MOBILUX / METALLUX

图 2 / Fig. 2

- METALLUX = MEX
- MOBILUX = MOX
- METALLIC = MIC



产品特性 / Characteristics

润湿特性: 浮型颜料

Wetting Behavior: Leafing Pigments

润湿特性

为防止颜料结块, 生产中的多个工序中都必须加入润滑剂。这对于金属颜料的润湿特性具有明显的作用。

浮型和非浮型颜料的润湿特性之间有着显著的差别。

浮型颜料

浮型颜料由于其表面张力很高, 不能被基料所浸润, 因此会浮在漆膜表面自我定向。这种效果通过使用润湿剂(如硬脂酸)来实现(图3)。

表 1 中列出了浮型颜料的典型特性及其应用领域。

在含有强极性溶剂或基料的涂料体系中, 浮型颜料经常会“下沉”而被浸润, 变成非浮型颜料。因此在设计涂料配方时必须作出考虑。如果必要的话, 应采用经过特殊稳定化处理的浮型颜料。

Wetting Behavior

A lubricant must be used in the various production processes to avoid coldwelding. This has a typical effect on the wetting behavior of the metal effect pigments. A difference is made between leafing and non-leafing pigments.

Leafing Pigments

Due to their high surface tension leafing pigments are not wetted by the binder, therefore, they float on the wet film and orient themselves on top of the surface. This effect is achieved by the use of, e.g. stearic acid as lubricant (fig. 3).

Table 1 shows typical properties and application fields.

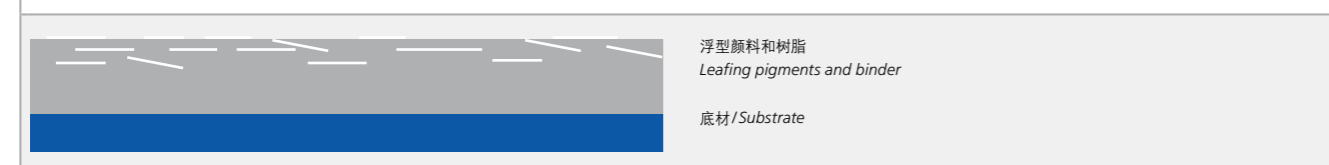
In paint systems with strongly polar solvents or binders there is always a danger that the leafing pigments will “drown” through wetting and turn into non-leafing pigments. This possibility must be taken into account when drawing up the formula of paints. If necessary special leafing-stabilized pigments should be used.

浮型铝颜料	
表 1	
特性	应用
高反光性 (可见光 - 红外线[热] - 紫外线)	一般工业涂料, 如槽罐涂料和屋面涂料等
得益于长扩散途径的屏蔽保护	防腐涂料
镀铬效果	装饰涂料
漂浮性与溶剂和基料的极性、酸值以及是否水性体系有关	
不耐刮擦	
难以上面漆	

Leafing Aluminium Pigments	
Table 1	
Typical properties	Application
High ability to reflect light: visible – IR (Heat) – UV	Industrial paints in general/ paints for tanks/roof coating
Barrier protection due to long diffusion path	Corrosion protection
Chrome effects	Decorative coatings
Leafing behavior depends on solvent or binder agent polarity – acid value – water	
Coatings are not rub-resistant	
Overcoating difficult	

漂浮特性 / Leafing Behavior

图 3 / Fig. 3



产品特性 / Characteristics

非浮型颜料

Non-Leafing Pigments

非浮型颜料

非浮型颜料既可以通过在浮型颜料中加入强极性物质或润湿剂来生产, 也可以在研磨过程中直接加入特殊润滑剂(如油酸)来生产。

非浮型颜料被完全润湿, 因此能在整个漆膜中均匀分布(图4)。

表 2 中列出了非浮型颜料的典型特性及应用领域。

Non-Leafing Pigments

Non-leafing pigments are created either by the addition of strongly polar substances or wetting agents to leafing pigments or by the use of special lubricants (e.g. oleic acid) directly during the milling process.

Non-leafing pigments are completely wetted and thus spread evenly throughout the entire paint film (fig. 4).

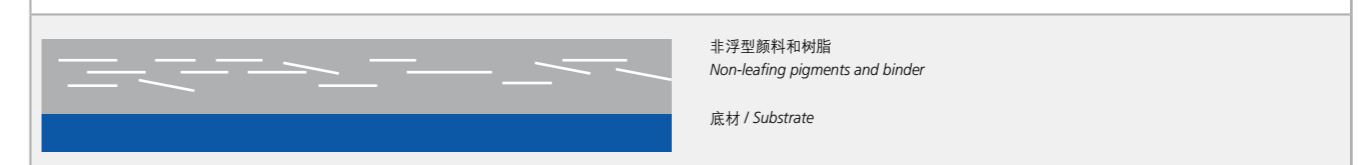
Table 2 shows their typical properties and application fields.

非浮型铝颜料的润湿特性	
表 2	
特性	应用
在漆膜中定向	底漆
耐刮擦	罐听涂料
可上面漆	卷钢涂料
可与彩色颜料组合使用	在涂料和油墨中具有多色效果
	锤纹效果
	三维效果
	汽车涂料
	金属效果

Wetting Behavior of Non-Leafing Aluminium Pigments	
Table 2	
Typical properties	Application
Orientation in the paint film	Base coats
Completely resistant to rubbing	Can coating
Overcoating possible	Coil coating
Combination with colour pigments possible	Polychromatic effects in paints and printing inks
	Hammer finish effects
	3D-effects
	Automotive coatings
	Metallic effects

非浮特性 / Non-Leafing Behavior

图 4 / Fig. 4



产品特性 / Characteristics

颗粒形状, 粒径以及粒径分布

Particle Shape, Particle Size and Particle Size Distribution

颗粒形状 – 粒径 – 粒径分布

由于金属的延展性, 形状不规则的雾化颗粒经过研磨后, 会被加工成成型系数 (厚度和直径之比) 为 1:50~1:500 的薄片。

薄片可以呈不规则的形状 (玉米片型), 也可以近于圆形 (银元型)。银元型颜料具有优秀的光学特性。它们采用很细的雾化铝粉, 经过极为精细的加工工艺制造而成。

片状颜料的厚度取决于产品需要以及研磨技术。颜料的粒径呈正态分布, 直接影响涂料的最终光学效果。因此质量控制时必须检测粒径分布并据此将颜料进行分级

Particle Shape – Particle Size – Particle Size Distribution

Owing to its ductility milling or crushing of the spattered aluminium in the ball mill creates flakes with shape factors of 1:50 to 1:500 (flake thickness: flake diameter).

The flake form varies from irregular cornflakes to almost completely round silverdollars. Silverdollars are aluminium pigments with extraordinary optical properties. They are produced in an elaborate process from very fine granules.

The particle sizes of the aluminium pigments vary according to the product and milling procedure. They show an (advanced) Gaussian distribution which decisively influences the optical properties of a coating. Therefore, the measuring of the particle size distribution is essential in order to classify the pigments and check their quality.

产品特性 / Characteristics

光学特性

Optical Properties

光学特性

金属颜料通过对光线的反射和散射, 产生出独具个性的效果。金属效果主要取决于下列因素:

- 粒径分布
- 颗粒形状
- 表面光滑度
- 颜料与相对于底材表面的定向程度
- 润湿性 (浮型 – 非浮型)

有时很难描述或测定金属效果的视觉印象, 因为金属效果是一种由多种不同效果组成的综合效果。

- 色相
- 金属感 (闪烁度和金属光亮度)
- 亮白度
- 随角异色性
- 色饱和度
- 色强度 (遮盖力)
- DOI 鲜映度

Optical Properties

Metallic effect pigments create their characteristic effects through reflection and scattering of light falling on the surface of the pigment. The metallic effect depends mainly on

- Particle size distribution
- Particle shape
- The smoothness of the surface
- Pigment orientation in relation to the surface of the substrate
- Wetting behavior (leafing – non-leafing)

It is somewhat difficult to describe or measure the visual impression of the metallic effect as it is made up of a number of characteristic individual effects:

- Colour shade
- Brilliance (sparkle and metallic gloss)
- Brightness
- Flop
- Colour saturation
- Tinting strength (hiding power)
- DOI (DOI = distinctiveness of image)



产品特性 / Characteristics

色相, 金属感, 白度, 色饱和度, 随角异色性, 遮盖力和鲜映度 Colour Shade, Brilliance, Brightness, Colour Saturation, Flop, Hiding Power and DOI

色相

铝颜料本身没有颜色, 但可通过光线反射所造成的金属感或金属色而与白色和黑色颜料区别开来。

目前市场上已有表面包覆了着色剂的彩色铝颜料在售。代表产品是BASF 公司包覆了氧化铁的 Paliocrom® 金色铝颜料。

而爱卡的 ALOXAL® 系列则是经过表面氧化控制处理的铝颜料。该系列呈香槟色, 创造出更多的色彩可能。当把它们和彩色颜料组合使用时, 可获得比普通铝颜料更暖调的金属效果。

ALOXAL® 颜料同时也具有高耐候性和高循环管线稳定性。

色相、金属感、白度、色饱和度、随角异色性、遮盖力和鲜映度
片状金属颜料与漆膜表面平行定向排列, 光线在它们表面上的反射和散射, 产生金属效果(如汽车漆的应用)。

反射光与散射光之间的比例决定了视觉的效果。反射光的比例随颜料的面积增大而增大, 而散射光的比例则随颜料边缘的增多而增加。(图 5)。

Colour Shade

Aluminium pigments have no colour of their own, they are achromatic, thus distinguishing from black and white pigments by their brilliance or metallic gloss.

Coloured aluminium pigments whose surfaces are coated with colouring agents are available too. The best known examples are gold-coloured aluminium pigments coated with iron oxides (Paliocrom®, a trademark of BASF, Ludwigshafen).

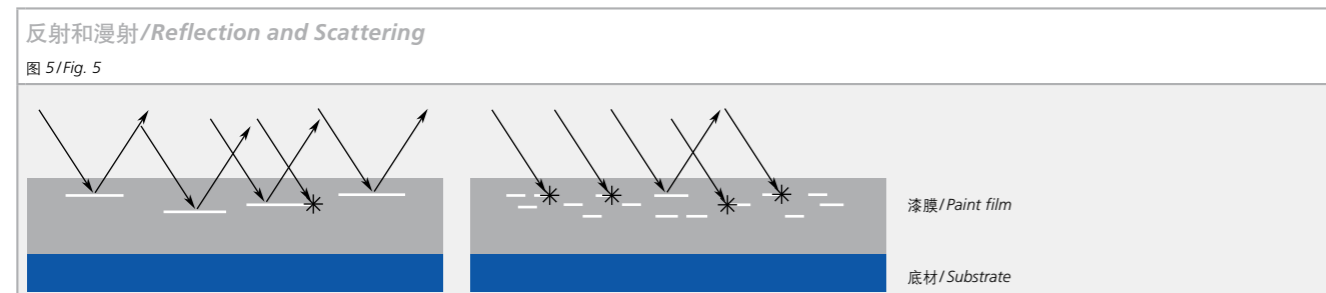
The product ALOXAL® consists of aluminium pigments coloured by controlled oxidation. ALOXAL® pigment types are champagne coloured which open up further colour possibilities. When mixed with colour pigments, in particular, warmer colour shades can be achieved than with conventional aluminium pigments.

ALOXAL® pigments are also weather resistant and stable in circulation lines owing to their increased shear stability.

Colour Shade, Brilliance, Brightness, Colour Saturation, Flop, Hiding Power and DOI

The metallic effect of e.g. car finishes is achieved by the reflection and scattering of light on the flakes, which are fixed in a more or less oriented way in a clear or transparent coating.

The visual impression created depends on the ratio between reflected and scattered light. The proportion of reflected light increases with the size of the pigment areas; the proportion of scattered light increases with the number of edges scattering the light (fig. 5).



颜料颗粒越粗, 形状越圆, 反射光的比例就越高, 因此产生的效果就越亮、越白, 色饱和度也越高。

随角异色性, 就是随观察角度的不同, 白度随之变化。如果观察一辆汽车的立面和水平面白度的不同, 或从不同角度观察汽车时, 就可以感觉到随角异色性。

颜料颗粒越细, 粒子结构越不规则, 散射光的比例就越高。表面越均匀, 越呈灰相, 随角异色就越不明显, 遮盖力就越高, 鲜映度就越好。鲜映度越高, 漆面上(亮光面)所反射的高对比度物体(如建筑、白云和树等)就越清晰。

人们既要求金属颜料的亮度高、金属感好以及随角异色性强, 同时又要求它们具有出色的遮盖力和鲜映度。然而, 这些特性对颜料粒径分布的要求却是相反的。(图 6)

优质的银元型颜料得益于其近于圆形的颗粒形状和狭窄的粒径分布, 可以满足以上除了遮盖力外的所有需求。而创新性的STAPA® METALLUX 1500 系列则可以同时提供优秀的金属感、金属闪烁效果和遮盖力。

The coarser the pigments and the rounder their shape, the higher the proportion of reflected light and, thus, the brilliance, brightness and colour saturation in coloured metallic coatings.

The flop, i.e. the alteration of the brightness in dependancy of the observation angle, increases as well. The flop is clearly displayed by the contrast of brightness between vertical and horizontal automotive parts, thus, looking at a car in different angles.

The finer the pigment and the more irregular its structure, the higher is the proportion of scattered light. The more uniform and greyer the effect, the whiter is the flop and the higher are the hiding power and the DOI value (distinctiveness of image). The higher the DOI value, the clearer is the reflection of objects such as buildings, clouds or trees on the coated surface (paint gloss).

There is a high demand for bright, brilliant metallic effect pigments with a strong flop which also provide good hiding power and DOI. But these properties are contrary to the particle size distribution (see fig. 6).

High-quality silverdollars fulfill these demands owing to their round shape and narrow particle size distribution, but they provide less hiding power. An innovation is the STAPA® METALLUX 1500 series: Brilliance and sparkling metallic effect combined with good hiding power.



产品特性 / Characteristics

色相, 金属感, 白度, 色饱和度, 随角异色性, 遮盖力和鲜映度
 Colour Shade, Brilliance, Brightness, Colour Saturation, Flop,
 Hiding Power and DOI

颜料的定向

除了色相、金属感、白度、色饱和度、遮盖力、随角异色性和鲜映度以外, 片状铝颜料在漆膜中的定向也决定了涂料的金属效果。

当片状颜料和漆膜表面平行定向排列时, 可以获得最佳效果。定向不佳会造成低光泽或不平整的浑浊状态。(图 7)

片状颜料的定向主要取决于配方及应用条件。溶剂的挥发使漆膜收缩, 铝颜料自然平行定向。涂料中的溶剂含量越高, 这种作用就越明显。因此, 低固体份涂料会比高固体份涂料更易获得良好的颜料定向和光学效果。

如需用到高固体份体系, 可使用能令溶剂快速挥发的树脂(如醋酸丁酸纤维素), 或能固定颜料颗粒的助剂来避免云雾现象。如果使用蜡分散体或其它表面活性剂起“间隔作用”, 使用前必须先进行测试。

Pigment Orientation

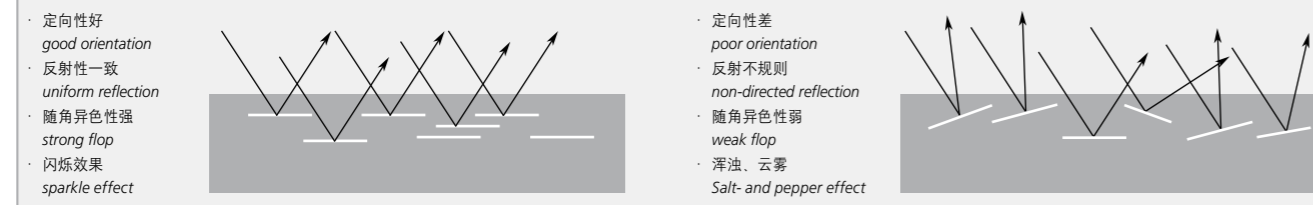
In addition to colour shade, brilliance, brightness, colour saturation, hiding power, flop and DOI, the orientation of the aluminium pigments in the paint film is a crucial factor to obtain a good metallic effect.

Best metallic effects are achieved when the pigments are aligned parallel to the film surface. Poor orientation results in a cloudy appearance or a turbulent “salt-and-pepper” effect (see fig. 7).

The orientation of the pigment in the coating is determined by the formulation and the conditions of the application: By the evaporation of the solvent the wet film shrinks and the aluminium pigments orient themselves parallel to the surface. The higher the proportion of solvent in the coating, the more significant is the alignment. In turn, this explains why a good pigment orientation and good optical properties are much easier achieved in low solid coatings than in high solid coatings.

If high solid coatings are used, the cloudy appearance can be avoided by using binding agents which release the solvents quickly (e.g. cellulose acetate butyrate) or by the addition of additives which fix the aluminium pigments. The function of wax dispersions or other surface active substances as „spacer“ needs to be tested in the respective binder.

颜料定向对光学效果的影响 The Influence of Particle Orientation on Optical Effect 图 7 / Fig. 7



不同涂料体系和不同应用对颜料定向和光学效果的影响 Influence of Coatings System and Application on the Orientation/on Optical Properties

图 8 / Fig. 8

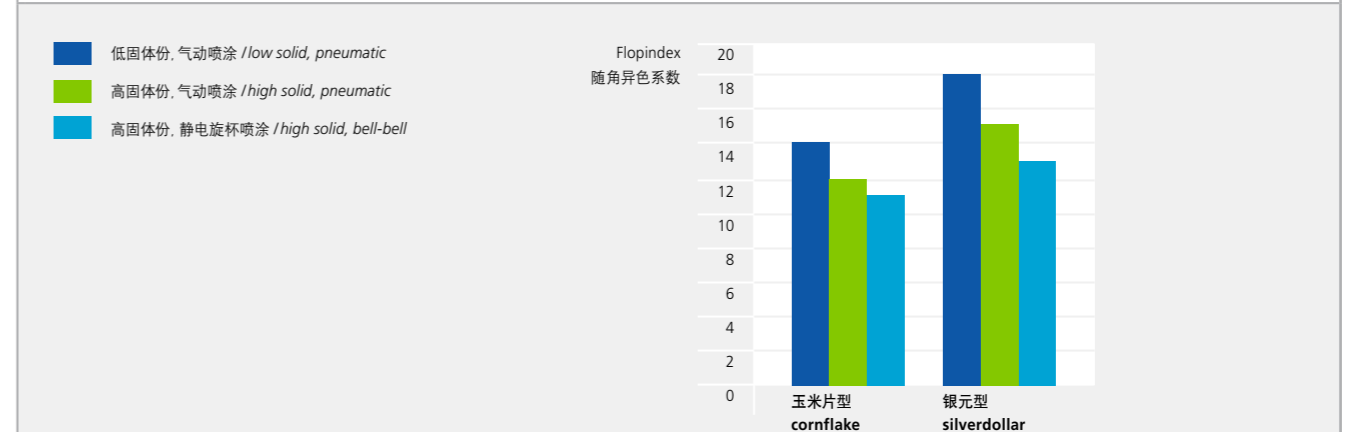
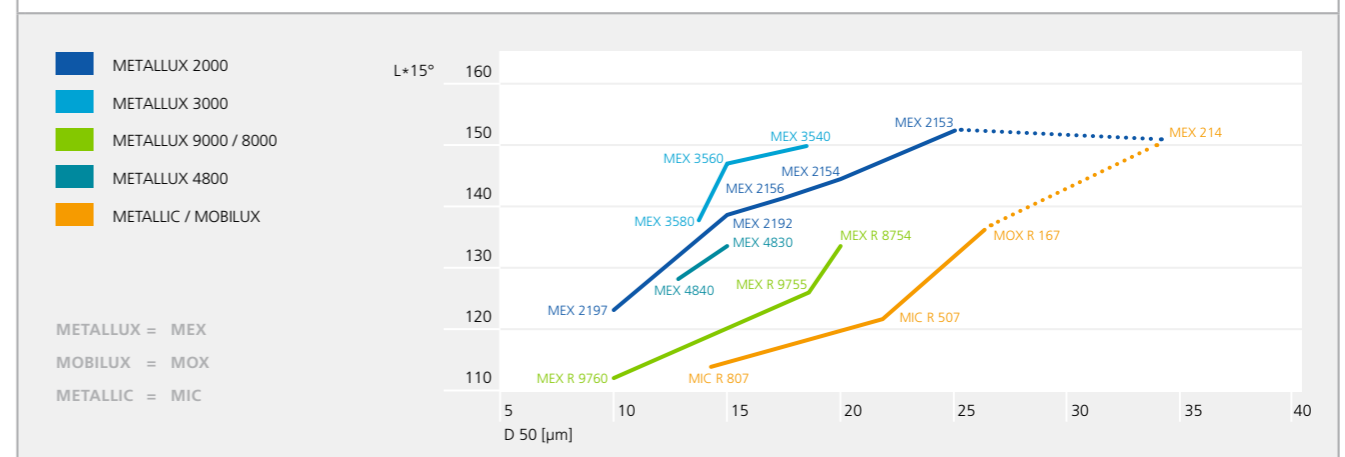


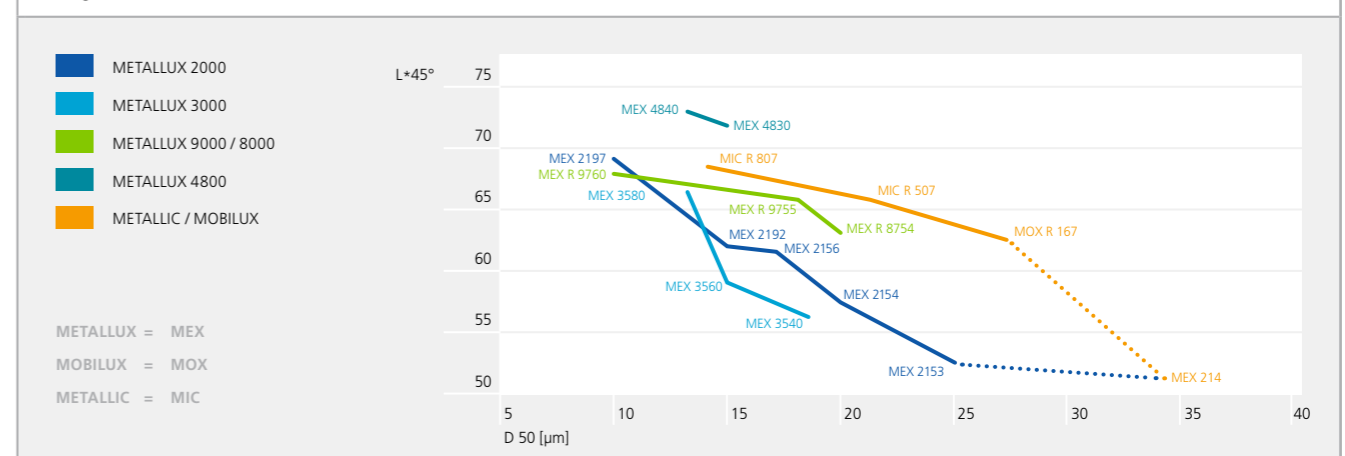
图 9/10 不同颜料系列不同角度的亮度比较

Fig. 9/10 compares the brightness of different product series.

亮度 L*15° / Brightness L*15° 图 9 / Fig. 9



亮度 L*45° / Brightness L*45° 图 10 / Fig. 10



产品特性 / Characteristics

机械特性

Mechanical Properties

机械特性

高机械剪切会造成金属效果颜料的损坏和变形, 进而令漆膜产生点状瑕疵或斑块, 光学效果下降, 甚至造成失去保护的金属表面与涂料体系之间的化学反应。

因此, 必须重视机械剪切对金属颜料的影响, 尤其是在分散以及在高要求的泵送系统和循环管线中使用金属涂料时。(参考“金属颜料的施工处理”)

Mechanical Properties

High mechanical shear forces can damage and deform the thin metallic effect pigments. The consequences might be a formation of spots, reduced optical effects and in the worst case chemical reactions between the aluminium pigments and the coating system – caused by damages of the aluminium pigments which result in unprotected surfaces.

Attention should be paid to the mechanical shear forces regarding their influence on aluminium pigments during dispersing and processing in critical pump systems and circulation lines (see “Processing of metallic effect pigments”).

产品特性 / Characteristics

金属颜料的施工处理

Processing of Metallic Effect Pigments

金属颜料的施工处理

金属颜料能否完全分散对于涂料可否产生没有粗点或斑块的完美金属效果至关重要。不过, 由于金属颜料的机械特性, 对它们的分散方法和对彩色颜料的并不相同。

一般推荐使用搅拌器来处理金属效果颜料。它们不会对颜料颗粒施加过强的机械剪切力。

分散(溶解)器应该在 500 – 800 rpm 的低速下操作。分散盘的形状也非常重要, 桨式的、平式的或齿状的搅拌器都比较合适。另外, 分散盘直径与分散容器直径之比最好介于 0.5 - 0.7 之间。

为了能够充分分散颜料, 分散盘的刀片要靠近分散容器的底部。

为了获得更均匀的分散效果, 应将金属颜料作预分散, 铝浆与溶剂的比例约为1:1至1:2。

对浮型铝浆的预分散, 可选用芳烃族溶剂(如二甲苯)和200#溶剂汽油。但是, 浮型铝浆的分散不可选用带极性的溶剂和润湿分散剂。否则, 浮型铝浆的漂浮性能将会丧失。

对非浮型铝浆的预分散, 可选用极性溶剂(如醇类、脂类或醚脂类), 以及它们之间的混合溶剂进行分散。

Processing of Metallic Effect Pigments

Complete dispersion of the metallic pigments in the paint is essential if full optical effects and a coating without spots are to be achieved. However, their mechanical properties require a dispersion process different to that of colour pigments.

Generally, mixers are recommended for the processing of metallic effect pigments that do not place a high mechanical shear force on the individual flake.

Stirrers (dissolvers) should be operated at low speeds of 500 – 800 rpm. Suitable shapes of dissolver discs are blade stirrers, flat or toothed dissolver discs. The ratio of the stirrer to dispersion vessel diameter should ideally be between 0.5 and 0.7.

During dissolving the mixing blade should be close to the bottom of the mixing vessel in order to ensure complete dispersion of the aluminium pigment paste.

A pre-dispersing of the metallic effect pigment in the solvent supports the homogenisation of the paste. The ratio of aluminium pigment paste to solvent should be about 1:1 to 1:2.

*Solvents suitable to pre-disperse **leafing pigments** are aromatic hydrocarbons (e.g. xylol) and mineral spirit. Polar solvents and dispersion wetting agents must not be used, otherwise the pigments are wetted, making them lose their leafing characteristics.*

*Solvents suitable to pre-disperse **non-leafing pigments** are polar solvents (e.g. alcohols, esters, ether ester) and mixed solvents.*

产品特性 / Characteristics

金属颜料的施工处理

Processing of Metallic Effect Pigments

添加合适的润湿分散剂可能有助于金属颜料的表面润湿, 加快金属片状颗粒之间的分散。因此, 润湿分散剂有助金属颜料浆更稳定, 减少返粗的产生。

不要使用氯烃类溶剂。在某些情况下, 氯烃类溶剂会分解出氯化氢并和分散好的颜料产生化学反应。此外, 溶剂不能含有水分, 以避免其与未经稳定化处理的铝浆产生化学反应。

较佳的分散方法是在搅拌状态下, 将溶剂缓慢加入铝浆中。一般情况下, 铝浆可以马上得到均匀分散。特殊情况下, 稍加浸泡和搅拌, 分散就可以完成。如果铝浆得到充分分散, 外观会变得粘稠。

建议按以下步骤操作:

- 首先, 将铝浆装入分散(搅拌)容器, 然后加入溶剂并持续搅拌
- 均匀分散后, 仔细检查有没有未完全分散的颜料
- 之后可继续调整和添加其它成分。如果需要的话, 继续添加溶剂, 使分散更充分, 然后再添加其它组分(如树脂、助剂等)

但是, 为了避免颜料或溶剂浓度的突然变化引起的颜料粘结, 经常要把这个步骤倒过来, 就是要将预分散好的铝浆在搅拌状态下加入树脂液中。

因此, 在生产前, 为了找到正确的涂料制备施工顺序, 有必要先进行相应的实验室试验。

在操作过程中要将盛铝浆的容器尽量盖严, 以防溶剂挥发引起铝浆结块。

Adding suitable wetting agents may improve the processing, i. e. the wetting and separating of the pigments is speeded up. Consequently, the paste is more stable and the risk of a pigment agglomeration is being reduced.

Chlorinated hydrocarbons are not suitable, as due to unfavorable conditions they can split off hydrogen chloride which in turn would react with the aluminium pigment.

It is important that the solvent does not contain any water in order to prevent a reaction of unstabilized pigments with water.

For easier processing, it is advisable to start with the aluminium pigment paste and after this add gradually the solvent while stirring. This premix can either be homogenized after a while ("soaking of the pigment paste") or immediately with a stirrer (dissolver). When all pigments are fully dispersed, the premix will show a thick appearance.

It is recommended to produce the coating in the following order:

- *First of all, put the pigment paste in the dispersion vessel, and then add gradually the solvent while stirring.*
- *After the homogenization, the pigment slurry should be examined for undispersed paste residue.*
- *After this check, the coating will be adjusted and further components will be added, i.e. if necessary for the paste consistency more solvent is added and all other formulation ingredients are added, too, such as binder, additives etc.*

In many cases, however, it is necessary to reverse the processing procedure, i.e. to add the predispersed metallic effect pigment to the binder. The reason is a tendency to concentrate, which leads to a pigment or solvent shock resulting in pigment agglomeration.

Therefore, it is essential to carry out laboratory tests in order to determine the correct order of manufacturing a coating.

During the whole processing it is important, that the paste is covered as much as possible in order to minimize the evaporation of the solvent. Otherwise agglomeration might occur.

产品特性 / Characteristics

循环系统中的稳定性 / 化学特性

Stability in Circulation Systems / Chemical Properties

耐剪切

在汽车喷涂中, 涂料在循环系统中要被持续泵送, 再进行喷涂。泵送系统会产生很高的剪切力, 尤其是在循环系统和喷涂装置之间的压力控制阀处。如此之高的剪切力会对金属颜料造成损伤。而在随后的分散过程中, 长时间的润湿放置和涡流也可能造成光学效果的变化。

因此, 一系列耐剪切的片状铝颜料, 被开发用于剪切力较高的循环系统当中。片状铝颜料的厚度越厚, 其机械稳定性就越好。

化学特性

铝的化学特性极大地限制了体系中对树脂和溶剂的选择。(表 3)

我们开发了适用于水性涂料体系的经过特殊稳定化处理的铝颜料 (STAPA® Hydro...), 用其制成的水性涂料具有良好的储存稳定性。

Degradation Resistance

In the automotive industry the coatings are constantly pumped in circulation systems and led off if required. High shear forces arise in critical pump systems, especially at the pressure control valves between the circulation line and the spraying device, which can damage the metallic effect pigment. Subsequent dispersion processes (subsequent wetting through long dwelling times and turbulences) can lead to a change in the optical effect.

Special aluminium pigments, so-called "non-degrading flakes", have been developed for particularly aggressive circulation systems. The greater thickness of the flakes provides higher mechanical stability.

Chemical Properties

The chemical properties of aluminium pigments limit the choice of binders and solvents (table 3).

For water-based coatings stabilized aluminium pigments (STAPA® Hydro...) have been developed which allow the formulation of storage stable water-based paints.

化学特性 / Chemical properties

表 3 / Table 3

不同介质中的反应 / Behavior towards	铝 / Aluminum
酸性介质 / Acid media	发气、发灰 / Gas formation, greying
碱性介质 / Alkaline media	发气 / Gas formation
卤素 / Halogens	发气 / Gas formation

STAPA®

STAPA® METALLIC

STAPA® MOBILUX

STAPA® METALLIC

粒径分布宽, 遮盖力强, 着色力高, 特别是细粒径规格稍呈灰色 (701/R707, 801/R807)

STAPA® MOBILUX

粒径分布窄, 色纯度高, 色相清晰

STAPA® METALLIC

Wide particle size distribution, good hiding power, intensive colour, slightly grey especially in the fine range (701/R707, 801/R807)

STAPA® MOBILUX

Narrow particle size distribution, high colour purity, for clear colour shades

STAPA® METALLIC STAPA® MOBILUX	固体份(颜料) Non-volatile content (pigment)	溶剂 Solvent	有机溶剂湿法筛析 ^t Screen analysis/wet sieving with organic solvents as rinsing liquid	粒径分布 Particle size distribution			比重 (典型值) Specific gravity (typical value)
	依据/acc. to DIN 55923 ± 2%		依据/acc. to DIN 53196 [µm]	检测仪器 determined by CILAS 1064			依据 acc. to DIN 53217
型号 / Grade	%	*	<40 不低于 min. [%]	D10 约/approx. [µm]	D50	D90	约/approx. [g/cm ³]
METALLIC 501/R 507	65	TE/SA	99,0	7	21	44	1,5
METALLIC 601/R 607	65	TE/SA	99,5	5	18	37	1,5
METALLIC 701/R 707	65	TE/SA	99,8	5	16	34	1,5
METALLIC 801/R 807	65	TE/SA	99,9	4	14	31	1,5
MOBILUX 151/R 157	65	TE/SA	98,5	18	35	55	1,5
MOBILUX 161/R 167	65	TE/SA	98,5	11	26	47	1,5
MOBILUX 171/R 177	65	TE/SA	99,0	11	25	46	1,5
MOBILUX 181/R 187	65	TE/SA	99,0	11	24	45	1,5

* TE = 200#溶剂汽油/Mineral spirit

SA = 石脑油溶剂/Solvent naphtha

STAPA® METALLUX 200

STAPA® METALLUX 200

粗闪型, 粒径分布极窄, 适用于闪烁的清晰色相

STAPA® METALLUX 200

Coarse sparkle grade, very narrow particle size distribution, for clear colour shades with sparkle effect

STAPA® METALLUX 200	固体份(颜料) Non-volatile content (pigment)	溶剂 Solvent	有机溶剂湿法筛析 Screen analysis/wet sieving with organic solvents as rinsing liquid		粒径分布 Particle size distribution			比重 (典型值) Specific gravity (typical value)
	依据/acc. to DIN 55923 ± 2%		依据/acc. to DIN 53196 [µm]		检测仪器 determined by CILAS 1064			依据 acc. to DIN 53217
型号 / Grade	%	*	<63 不低于 min. [%]	<40 不低于 min. [%]	D10 约/approx. [µm]	D50	D90	约/approx. [g/cm ³]
METALLUX 212/R 272	70	TE/SA	99,8	–	34	55	78	1,6
METALLUX 214/R 274	70	TE/SA	–	98,5	18	34	53	1,6
METALLUX 216/R 276	70	TE/SA	–	98,5	14	30	51	1,6
METALLUX 217/R 277	65	TE/SA	–	98,5	13	29	50	1,5
METALLUX 218/R 278	65	TE/SA	–	98,5	12	28	49	1,5

* TE = 200#溶剂汽油/Mineral spirit

SA = 石脑油溶剂/Solvent naphtha

STAPA®

STAPA® METALLUX 600

STAPA® METALLUX 8000

STAPA® METALLUX 9000

STAPA® METALLUX 600

粒径分布较宽, 粒径细, 遮盖力很高, 细粒径规格呈灰相(618/R678)

STAPA® METALLUX 8000

粒径细, 粒径分布窄, 适用于清晰色相

STAPA® METALLUX 9000

丝光型, 亮白, 粒径细, 随角异色性低, 色调明亮

STAPA® METALLUX 600

Relatively wide particle size distribution, fine, very good hiding power, grey in fine range (618/R678)

STAPA® METALLUX 8000

Fine, narrow particle size distribution, for clear colour shades

STAPA® METALLUX 9000

Silky gloss grades, very bright and fine, low flop, for silky gloss and bright colour shades

STAPA® METALLUX 600/8000/9000	固体份(颜料) Non-volatile content (pigment)	溶剂 Solvent	有机溶剂湿法筛析 Screen analysis/wet sieving with organic solvents as rinsing liquid		粒径分布 Particle size distribution			比重 (典型值) Specific gravity (typical value)
	依据/acc. to DIN 55923 ± 2%		依据/acc. to DIN 53196 [µm]		检测仪器 determined by CILAS 1064			依据 acc. to DIN 53217
型号/Grade	%	*	<40 不低于 min. [%]	<25	D10 约/approx. [µm]	D50	D90	约/approx. [g/cm³]
METALLUX 612/R 672	65	TE/SA	–	99,9	9	20	33	1,5
METALLUX 617/R 677	65	TE/SA	–	99,9	5	13	26	1,5
METALLUX 618/R 678	65	TE/SA	–	99,9	4	12	24	1,5
METALLUX 8154/R8754	65	TE/SA	–	99,9	9	20	32	1,5
METALLUX 9155/R9755	65	TE/SA	–	99,5	6	18	33	1,5
METALLUX 9157/R9757	65	TE/SA	–	99,5	7	17	29	1,5
METALLUX 9160/R9760	65	TE/SA	99,5	–	4	13	28	1,5

* TE = 200#溶剂汽油/Mineral spirit

SA = 石脑油溶剂/Solvent naphtha

STAPA® METALLUX 700

用于罐听和卷材涂料的铝浆

Aluminium Pigment Pastes for Can and Coil Coating

METALLUX 700 系列专门为罐听涂料和卷材涂料开发。这种颜料展示了优异的润湿性, 并具有很好的排列定向性能。

与其它同等粒径大小的铝颜料相比, 该系列能展现出更高的遮盖力和更佳的金属光泽。

The METALLUX 700 series has been particularly designed for can and coil coating applications. These pigments show an excellent wetting behavior and very good orientation.

Furthermore, the 700 series shows increased hiding power and improved brilliance compared to aluminium pigments with similar particle size distribution.

STAPA® METALLUX 700	固体份(颜料) Non-Volatile Content (Pigment)	溶剂 Solvent	有机溶剂湿法筛析 Screen Analysis/wet sieving with organic solvents as rinsing liquid			粒径分布 Particle Size Distribution			比重 (典型值)Specific Gravity (Typical Value)
	依据/acc. to DIN 55923 ± 2%		依据/acc. to DIN 53196 [µm]			检测仪器 determined by CILAS 1064			依据 acc. to DIN 53217
型号/Grade	%	*	<45 不低于 min. [%]	<40	<25	D10 约/approx. [µm]	D50	D90	约/approx. [g/cm³]
METALLUX 719 CC	70	TE/SA	–	–	99,5	10	19	30	1,6
METALLUX 730 CC	65	TE/SA	–	99,0	–	14	31	54	1,5
METALLUX 750 CC	65	TE/SA	–	–	99,5	9	21	35	1,5
METALLUX 760 CC	65	TE/SA	–	–	99,5	8	20	34	1,5

* TE = 200#溶剂汽油/Mineral spirit

SA = 石脑油溶剂/Solvent naphtha

STAPA®

STAPA® METALLUX 1000

STAPA® METALLUX 1500

STAPA® METALLUX 2000

STAPA® METALLUX 3000

STAPA® METALLUX 4800

STAPA® METALLUX 1000

集高着色力, 高遮盖力, 高闪烁, 高金属感于一身

STAPA® METALLUX 1500

高金属感银元型, 出众金属效果, 独特的遮盖力

STAPA® METALLUX 2000

标准银元型, 粒径分布窄

STAPA® METALLUX 3000

银元型, 粒径分布极窄, 优异的金属感和色纯度

STAPA® METALLUX 4800

亮白银元型, 各角度都显白

STAPA® METALLUX 1000

Tinting strength/hiding power and sparkle effect in one pigment, high brilliance

STAPA® METALLUX 1500

Highly brilliant silverdollar, pronounced metallic effect, unique hiding power

STAPA® METALLUX 2000

Standard silver dollar, narrow particle size distribution

STAPA® METALLUX 3000

Silverdollar, very narrow particle size distribution, excellent

brilliance and colour purity

STAPA® METALLUX 4800

White silverdollar, light over all angles

STAPA® METALLUX 1000 / 1500 / 2000 / 3000 / 4800

型号/Grade	固体份(颜料) Non-Volatile Content (Pigment)	溶剂 Solvent	有机溶剂湿法筛析 Screen Analysis/wet sieving with organic solvents as rinsing liquid		粒径分布 Particle Size Distribution			比重 (典型值) Specific Gravity (Typical Value)
	依据/acc. to DIN 55923 ± 2%		依据/acc. to DIN 53196 [µm]		检测仪器 determined by CILAS 1064		依据 acc. to DIN 53217	
	%	*	<40 不低于 min. [%]	<25	D10 约/approx. [µm]	D50	D90	约/approx. [g/cm³]
METALLUX 1051	70	TE/SA	–	99,5	12	23	37	1,6
METALLUX 1071	65	TE/SA	–	99,5	11	23	35	1,5
METALLUX 1520	70	TE/SA	99,9	–	21	36	59	1,6
METALLUX 1540	70	TE/SA	99,9	–	15	26	41	1,6
METALLUX 1560	70	TE/SA	99,9	–	10	18	28	1,6
METALLUX 1580	65	TE/SA	99,9	–	6	12	20	1,5
METALLUX 2153	70	TE/SA	–	99,5	14	25	38	1,6
METALLUX 2154	70	TE/SA	–	99,5	11	20	32	1,6
METALLUX 2156	70	TE/SA	–	99,5	9	17	28	1,6
METALLUX 2192	70	TE/SA	–	99,0	7	15	26	1,6
METALLUX 2195	65	TE/SA	–	99,5	6	12	23	1,5
METALLUX 2197	65	TE/SA	–	99,5	4	9	15	1,5
METALLUX 3540	70	TE/SA	–	99,5	12	18	27	1,6
METALLUX 3560	72	TE/SA	–	99,8	8	14	22	1,6
METALLUX 3580	60	TE/SA	–	99,9	7	13	20	1,4
METALLUX 3590	60	TE/SA	–	99,9	7	12	19	1,4
METALLUX 4830	60	TE/SA	–	99,8	8	14	23	1,4
METALLUX 4840	60	TE/SA	–	99,8	7	13	22	1,4

* TE = 200#溶剂汽油/Mineral spirit

SA = 石脑油溶剂/Solvent naphtha

NDF – 耐剪切片状铝颜料

循环管线稳定性好, 耐剪切, 多种粒径选择, 适合极清晰色相

Pigments are stable in circulation systems, high shear stability, all finenesses, for very clear colour shades

NDF 型号/Grade	固体份(颜料) Non-Volatile Content (Pigment)	溶剂 Solvent	有机溶剂湿法筛析 Screen Analysis/wet sieving with organic solvents as rinsing liquid			粒径分布 Particle Size Distribution			比重 (典型值) Specific Gravity (Typical Value)	
	依据/acc. to DIN 55923 ± 2%		<45 不低于 min. [%]	<40 min. [%]	<25	检测仪器 determined by CILAS 1064	D10 约/approx. [µm]	D50 约/approx. [µm]	D90 约/approx. [µm]	依据 acc. to DIN 53217
	%	*								约/approx. [g/cm³]
120	70	TE/SA	–	–	99,5	6	12	20	1,6	
130	70	TE/SA	–	–	99,0	6	13	23	1,6	
150	70	TE/SA	99,9	–	–	8	15	24	1,6	
165	80	TE/SA	99,9	–	–	8	17	30	1,8	
170	80	TE/SA	99,9	–	99,0	9	17	29	1,8	
200	80	TE/SA	–	–	99,0	11	20	30	1,8	
340	83	TE/SA	–	99,0	–	17	34	56	1,8	
2120	70	TE/SA	–	–	99,5	7	12	20	1,6	
2140	70	TE/SA	99,9	–	–	9	14	22	1,6	
2180	75	TE/SA	–	–	99,0	11	19	30	1,8	
3125	70	TE/SA	–	–	99,5	8	13	20	1,6	
3150	75	TE/SA	99,9	–	–	10	16	24	1,7	
3250	83	TE/SA	99,9	–	–	14	25	45	1,8	

* TE = 200#溶剂汽油/Mineral spirit

SA = 石脑油溶剂/Solvent naphtha

ALOXAL®

ALOXAL® 香槟色铝颜料

ALOXAL® 是表面经过氧化控制处理的铝颜料。当与彩色颜料混合使用时, 可产生比普通铝颜料更暖调的金属效果。

ALOXAL® 的耐剪切性能经过增强, 适应循环管线并且耐候。

技术数据

- 浆状, 65 % 固体份, 溶剂为丙二醇甲醚
- 溶剂耐性极高
- 耐候性与普通铝颜料相当
- 储存稳定期1年
- 分散中的耐剪切稳定性好, 可加快混合速度

ALOXAL® Aluminium Effect Pigments

ALOXAL® pigments are champagne coloured pigments which are created by controlled oxidation of aluminium pigments. When mixing with colour pigments warmer colour shades than with conventional aluminium pigments can be achieved. ALOXAL®-Pigments are also weather resistant and stable in circulation lines due to their increased shear stability.

Technical Data

- Delivery form: 65% in methoxy propanol (paste)
- Solvent resistance: excellent
- Weather stability: comparable to aluminium pigments
- Storage stability: 1 year
- Dispersability: efficient incorporating due to improved shear stability

ALOXAL® 型号/Grade	固体份(颜料) Non-volatile content (pigment)	溶剂 Solvent	有机溶剂湿法筛析 Screen analysis/wet sieving with organic solvents as rinsing liquid		粒径分布 Particle size distribution			比重 (典型值) Specific gravity (typical value)	
	依据/acc. to DIN 55923 ± 2%		[µm] <40 不低于 min. [%]	<25	检测仪器/determined by CILAS 1064	D10 约/approx. [µm]	D50 约/approx. [µm]	D90 约/approx. [µm]	依据 acc. to DIN 53217
	%	*							约/approx. [g/cm³]
PM 2010	65	PM	–	99,5	9	19	32	1,5	
PM 3010	65	PM	–	99,5	11	20	31	1,5	
PM 4010	65	PM	98,5	–	18	33	52	1,5	

* PM = 丙二醇甲醚/Methoxy propanol

应用于环保水性涂料体系的金属效果颜料 Metallic Effect Pigments in Environment-Friendly Water-Based Coating Systems

环境污染和原材料短缺等问题在近年日趋严重。受环境保护有关法规的约束, 涂料行业, 尤其是涂料应用行业正在努力减少自身对环境的污染。

这不仅推动了涂装行业的改进(如通过采用静电喷涂, 使涂装作业更为有效), 机械行业和热空气净化工艺的进步(如过滤器和焚烧工艺等), 更推动了有利于环保的, 低溶剂甚至无溶剂的涂料体系的开发。

水性涂料体系

如第17页介绍, 铝的化学特性决定了它很难被应用到水性涂料体系中(如分散体、水溶性体系、阳极和阴极电泳涂料等)。

主要困难并不在于如何使用合适的表面活性剂或水溶性溶剂来分散疏水性的金属颜料这个基本要求, 而在于通过采用恰当的保护机理, 来保证水性金属颜料的储存稳定性和加工性。

水性涂料所用的铝颜料不仅在水中要求稳定, 而且在各种不同的树脂体系中也同样需要稳定。因此, 颜料的发气稳定性只是一个相对参数, 它很大程度上取决于涂料的组成方式。例如, pH值就十分重要。同样重要的还有基料中用于中和的碱强度以及基料中各种组成跟颜料和助溶剂之间的亲合度。

Pollution and the shortage of raw materials have increased dramatically over recent years. The paint industry and particularly the paint processing industry are called to play their part in reducing environmental pollution by respective legislation and regulations.

This has led not only to improvements in application processes (e.g. more efficient application achieved by electrostatic coatings) and mechanical and thermic air purification processes (filter, thermal post-combustion etc.), but especially the development of environment-friendly i.e. low solvent or solvent-free coating systems.

Water-Based Coating Systems

The chemical properties of aluminium pigments described on page 17 mean that their use in water-based paint systems (dispersions, soluble systems, anodic and cathodic electro-dipcoating etc.) is highly critical.

The main challenge is not making the basically hydrophobic metallic effect pigments water-dispersible by the use of suitable tensides or the addition of water-miscible solvents, rather it is ensuring the storage stability and processing properties of water-based metallic effect pigment paints by using appropriate protection mechanisms.

Aluminium pigments for water-based coating systems must be stable not only in contact with water but also with a wide variety of different binder systems. Gassing stability therefore depends to a large extent on the composition of the coating and is thus only a relative parameter. The pH-value, the nucleophilia of the alkalines used to neutralize the binder and the presence of chemical groups in the binder with an affinity to the pigment as well as the organic solvent contained as a co-solvent, play a very important role.



因此, 铝颜料的发气稳定性应该在特定的水性涂料中进行实际测试。实践证明, 在 40°C 下采用气泡仪测定产生的氢气体积, 是一种十分有价值的量化评估发气稳定性的方法。

实现铝颜料的稳定化有两个标准方法:

- 在铝颜料表面吸附一层合适的抗腐蚀剂
- 在铝颜料表面包覆一层保护层

适用于水性体系的爱卡铝浆有:

添加剂稳定型铝浆

- STAPA® HYDROLAN
- STAPA® HYDROMIC

包覆型铝浆

- STAPA® HYDROLUX
- STAPA® HYDROLAN

PVD 镀铬效果铝浆

- HYDROSHINE

若需进一步了解有关水性涂料体系的资料, 可索取"STAPA®用于水性涂料的铝浆"的技术资料。

The gassing stability of an aluminium pigment should therefore be tested in the given water-based coating. The measurement of hydrogen development in the coating during storage at 40 °C in a gas bubble meter has proved valuable for quantitative assessment.

Two main processes have become standard for the stabilization of aluminium pigments:

- Absorption of suitable corrosion inhibitors on the surfaces of the pigments
- Encapsulation of the pigments with a protective coating

Suitable products for use in water-based systems are amongst others:

Additiv-Stabilized Pigments:

- STAPA® HYDROLAN
- STAPA® HYDROMIC

Encapsulated Pigments:

- STAPA® HYDROLUX
- STAPA® HYDROLAN

PVD-Pigments:

- HYDROSHINE

For further information about water-based coating systems please ask for the brochure "STAPA® Aluminium pastes for aqueous coating systems".

质量控制及检验方法

Quality Control and Testing Methods

比色

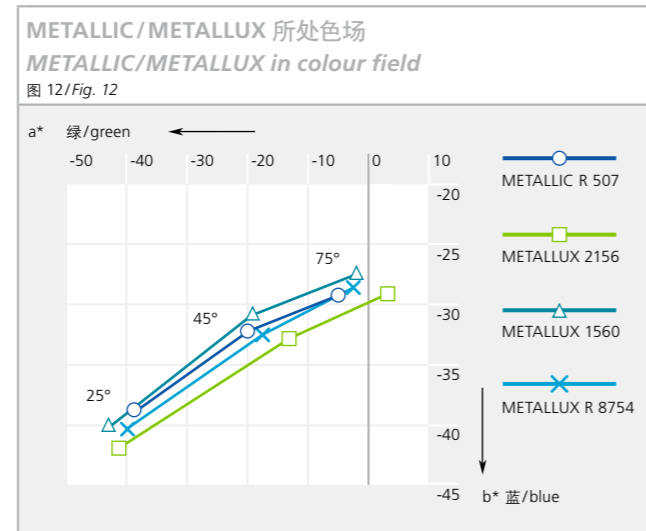
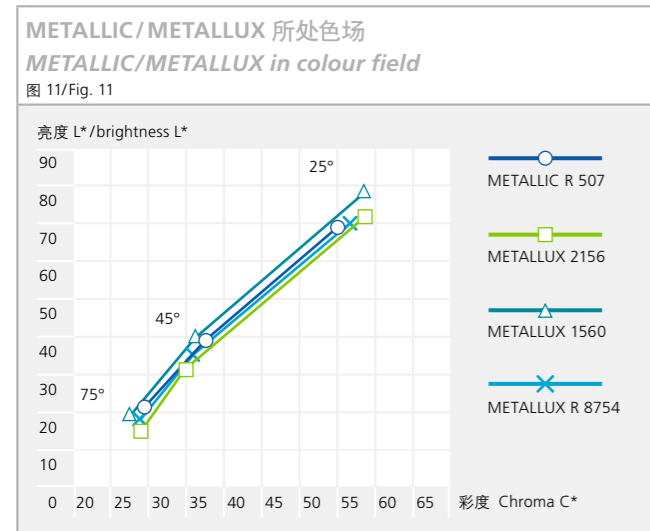
金属涂层的视觉效果很大程度上取决于观察角度和光线条件。条件发生变化，视觉效果也随之变化。可以使用多角度分光测光仪 (BYK-Gardner BYK-mac) 通过比色来测量金属涂层的效果。对效果的评价需要同时考虑不同方面的测量结果，包括白度 L^* 值 vs 色强度值 (Chroma C^*) 以及红绿轴值 a^* vs 黄蓝轴值 b^* 。测量通常会通过三个角度进行：25°、45° 和 75°。结果以色彩模型系统如 $CIEL^*a^*b^*$ 或 $L^*C^*h^\circ$ 来表示。

比色测量如 $CIEL^*a^*b^*$ 或 $L^*C^*h^\circ$ 的结果以图示表示。图 11 和 12 对比了以不同铝颜料制成的蓝色金属漆双涂应用的测量结果。

Colourimetry

The visual appearance of metallic coatings strongly depends on the viewing angle and the light conditions. A spectrophotometer for metallic colours (e.g. BYK-Gardner BYK-mac) helps to colourimetrically measure a metallic coating. The characterisation requires a simultaneous consideration of different measurements, such as brightness L^* vs. colour strength (chroma C^*), red green value a^* vs. yellow blue value b^* . For standard products the angles of 25°, 45° and 75° are measured. Subsequently, the results are presented in a colourimetric system, such as $CIEL^*a^*b^*$ or $L^*C^*h^\circ$.

Colourimetric systems, such as $CIEL^*a^*b^*$ and $L^*C^*h^\circ$, visualize the results graphically. The figures 11 and 12 compare different aluminium pigments, which had been applied in a blue metallic 2 coat finish.



质量标准的保证

为了确保品质，不同规格各个批次的爱卡产品都要经过严格的检查，确保其符合各方面的对应质量标准。所有产品的所有批次都要同时符合应用和环保的要求，各产品本身的一致性都要最大化。

白度和着色力是两个非常重要的质量指标。色强度值代表了金属效果颜料的遮盖力。

Guarantee of Quality Standard

The quality control of the batches is done by means of differential measurement against the defined corresponding standard. It is a precondition that the samples are simultaneously applied in the same coating system and under constant environmental parameters. In doing so, processing related variations of the sample application are minimized.

The values of brightness and tinting strength are very important assessment criteria. The colour strength value characterizes the hiding power of a metallic effect pigment.



质量控制及检验方法

Quality Control and Testing Methods

质量控制

对金属效果颜料的质量控制,除了要针对其产品技术数据表列举的各项参数数据外,还应针对其光学特性。对颜料本身和对颜料应用效果的检测要区分开来。

对颜料的检测:

- 依据 DIN 53196 和 ASTM 11 进行筛析
- 依据 ISO 13320-1 进行粒径分布的激光测量
- 依据 DIN 55923 测量挥发份和非挥发份含量

对颜料应用效果的检测:

- 金属效果 (随角异色性)
- 白度
- 鲜映度 (DOI)
- 色饱和度
- 着色力
- 遮盖力
- 光亮度
- 闪烁度

另外,对应水性铝浆还应测试其发气稳定性 (未有国际标准)。

Quality Control

The quality control of metallic effect pigments comprises tests of optical properties – additionally to the quality criteria mentioned in the technical data sheets. A distinction is drawn between the tests of the pigment and on the application.

Tests of the pigment:

- Screen analysis (near-mesh sieving) according to DIN 53196 respectively ASTM 11
- Particle size distribution by laser granulometry according to ISO 13320-1
- Volatile and non-volatile content on the basis of DIN 55923

Tests on the application:

- Metallic effect (flop)
- Brightness
- Distinctiveness of image (DOI)
- Colour saturation
- Tinting strength
- Hiding power
- Measuring of gloss
- Measuring of effect (sparkle)

Aluminium pigment pastes for water-based coating systems are additionally tested on gassing stability (not standardized).

粒径分布的激光测定

Determination of the Particle Size Distribution by Laser Granulometer

粒径分布 (典型值) 的测定方法根据 ISO 13320-1 标准,采用激光粒度测定仪测定。

测量的结果除了与仪器的硬件 (制造商、类型) 和软件 (计算机程序、设备等) 有关外,还和下列因素有关:

- 分散方法
- 分散设备
- 分散介质
- 分散能量
- 分散时间

检测通常使用超声波进行分散。可以在内置的超声波槽内,或者更好是在外置的超声波槽中分散颜料。

超声波频率越高,在分散容器中的能量越大,最细的颗粒就越会被分散开来,颜料就越显细。当超声波能量极高时,原来的颜料颗粒会碎裂,形成超细的颗粒。

分散时间的影响可由 D50 这一中央值反映出来。分散时间越长,该值越低,即颜料的外观越细。

与分散能量和分散时间相比,分散介质对结果的影响则较小。常用于质量控制 (QC) 的介质是异丙醇。若使用其它溶剂,应事先检查一下装置的材料是否适应。

爱卡所使用的详细检验方法 (测试指南) 可来函索取。

The measuring of the particle size distribution (typical value) follows the method of the laser granulometry according to ISO 13320-1.

In addition to the hardware (equipment manufacturer and type) and software the results of the laser granulometer are highly dependent on the following parameters:

- Way of dispersion
- Dispersing device
- Dispersing medium
- Dispersion energy
- Dispersion time

Usually, the sample is dispersed by ultrasound. It is possible to use the integrated ultrasonic bath or, preferably, to predisperse the sample in an external ultrasonic bath.

The higher the ultrasonic frequency respectively the greater the energy concentration in the dispersing vessel, the finer the sample will appear, because more of the finest particles have been dispersed. In the case of a very high energy concentration, finest particles will be generated by mechanical breaking off from the original pigment.

The longer the dispersion time, the smaller the value of the particle size distribution (D50). The sample appears finer again.

The dispersion medium has little effect on the measurement results. For quality control, usually isopropanol is used. The material properties of the device should be checked before using other solvents.

A detailed description of the testing method (test instruction) of ECKART can be obtained upon request.





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谨致友好问候
With compliments

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