

Formulation guidelines for formulating effect pigments in anhydrous powder products like eye shadow, face powder, blusher, etc.

For powder products the choice of effect pigments comprises the SYNCRYSTAL pearlescent pigment range, the MIRAGE pearlescent pigment range and the VISIONAIRE metallic pigment range. The use of these product lines and their optical properties are described as follows:

SynCrystal pearlescent pigments: Effect vs. particle size

The SynCrystal product line based on achromatic titanium dioxide coated synthetic fluorphlogopite flakes (artificial mica) offers new ways to achieve very bright formulations. Due to the synthetic origin of the substrate the level of impurities is. The smooth coating of titanium dioxide on synthetic fluorphlogopite leads to remarkable silvery pearlescence as well as outstanding rainbow-like colors derived from interference effects.

With the right choice of pearlescent pigments various coloring effects can be achieved. Pigments of small particle size (< 25 µm) create silky and satin effects and will opacify the mass. They enhance the hiding power of formulations and provide good coverage as well. Larger sized fractions (20-150 µm/20-250 µm) create high luster effects, either sparkling or dazzling, combined with very high brilliance and transparency.

Table 1: Effect versus particle size

Particle Size	Effect	Silver Effects	Interference Effects
10 – 50 µm	Strong pure pearl effect	SynCrystal Silver	SynCrystal Gold SynCrystal Red SynCrystal Blue
20 – 150 µm	Pure sparkling effect	SynCrystal Sparkling Silver	

Adding color to powder products

The SYNCRYSTAL pigment range can be used to add very bold and pure effect to powder formulations. They offer a higher brilliance and impressive effect compared to pearlescent pigments. Due to their synthetic origin SynCrystal pigments show a very white powder color which does not influence the color of the final powder mixture in a negative way. Their use level is system and effect depended as well as influenced by the presence of other colorants in the formulation like pearlescent pigments, metallic pigments or iron oxides. SynCrystal pigments used alone exhibit extraordinary effects already at very low use levels, combined with other colorants the use level has to be increased.

Combination with other raw materials

All recommended effect pigments show excellent compatibility with other colorants and specialty fillers used in cosmetics, including all other pigments and dyes for use in powders. Next to standard colorants, also coloured pearlescent pigments can be used to provide color to powder formulas. In contrast to iron oxides, they will not only color the product but also provide a subtle shine.

Procedure

A few basic rules need to be considered in formulations containing effect pigments.

General rules:

- **Consider color mixing rules:** Absorption pigments mix subtractively, because the visible color is the non-absorbed portion of light. A mixture of yellow and blue is green – a mixture of all colors is black. Interference pigments mix additively, because the visible color is the reflected portion of light. A mixture of complementary colors like yellow and blue is white – a mixture of all colors is white.

Table 2: Recommended pigmentation in powders:

<i>Desired effect</i>	<i>Finished Product</i>	<i>Recommended concentration</i>	<i>Remarks</i>
Skin coloring	Pressed eye shadow	20 – 70 %	Pigment concentration depends on the binder system used
	Loose eye powder	Up to 100 %	Little or no binder necessary
Highlighting, sparkling effects	Blusher (loose or pressed)	1 – 40 %	-
	Face powder (loose or pressed)	1 – 5 %	-
	Body powder	Up to 100 %	-

Physical Properties

- SynCrystal Silver and Interference are heat stable up to 600 °C.
- SynCrystal Silver and Interference can be used in the range between pH 2-11.

Regulatory limitations

No limitations for pearlescent pigments in powder application in EU/Japan/US.

MIRAGE pearlescent pigments: Effect vs. particle size

MIRAGE effect pigments distinguish themselves by their extraordinary sparkle effects and glamorous look. The smooth metal oxide coating of the calcium sodium borosilicate flakes leads to very high transparency and pure interference colors. Due to the carefully controlled upper limit of the particle size even the MIRAGE Glamour pigments, ranging from 35 - 150 µm, have a remarkable pleasant skin feel. Their performance is outstanding in respect to unique color purity and high gloss.

The MIRAGE Earth Tone shades of Sparkling Champagne, Bronze, Copper and Fire-Red compliment the Mirage portfolio. They provide cosmetic applications with an sparkling effect and a prestigious shine.

Table 3: Effect vs. particle size

<i>Particle Size</i>	<i>Effect</i>	<i>Silver Effects</i>	<i>Interference Effects</i>	<i>Gold to Earthtone Effects</i>
10 – 70 µm	Graceful Effects	MIRAGE Bright Silver	MIRAGE Bright Gold MIRAGE Bright Blue	
15 – 120 µm	Sparkle Effects	MIRAGE Sparkling Silver		MIRAGE Sparkling Luxury Gold MIRAGE Sparkling Champagne MIRAGE Sparkling Bronze MIRAGE Sparkling Copper MIRAGE Sparkling Fire-red
35 – 150 µm	Luxurious Effects	MIRAGE Glamour Silver	MIRAGE Glamour Gold MIRAGE Glamour Red, MIRAGE Glamour Blue, MIRAGE Glamour Green	
100 – 700 µm	Glitter Effects	MIRAGE Twinkling Silver		

Adding special optical effects to loose or pressed powder formulations

The MIRAGE pigment range can be used to add special sparkling and glamour effects to powder formulations. They offer a higher brilliance and gloss compared to other pearlescent pigments, thanks to their reflektivty. Due to their synthetic origin, MIRAGE pigments show a neutral white powder color which does not influence the color of the final powder mixture. Their use level is system and effect depended as well as influenced by the presence of other colorants in the formulation like pearlescent pigments, metallic pigments or iron oxides.

If only MIRAGE pigments are used as colorant, they exhibit extraordinary effects already at very low use levels, combined with other colorants the use level has to be increased.

Table 4: Mirage Colored Pigments

<i>Particle Size</i>	<i>Product</i>
35 - 150 µm	Mirage Glamour Sapphire

Table 5: Recommended pigmentation in powder formulations:

<i>Finished Product</i>	<i>Use Level</i>
Pressed Powder	12 – 25%
Loose Powder	1,5 – 100%

Procedure

A few basic rules need to be considered while formulating with MIRAGE effect pigments. They are easy to disperse in any powder system and show excellent compatibility with other cosmetic raw materials.

Physical Properties

- MIRAGE Silver and Interference pigments are heat stable up to 500 °C.
- MIRAGE Sparkling Luxury Gold is heat stable up to 120 °C.
- MIRAGE Silver and Interference pigments can be used in the range between pH 2-11.
- MIRAGE Sparkling Luxury Gold can be used in a range between pH 5-9.
- MIRAGE Glamour Sapphire should be used in the range between pH 4 -7,5.
- MIRAGE Glamour Sapphire have a lower light stability than any other pearlescent pigments (color fading under light exposure)

Regulatory limitations

No limitations for MIRAGE pearlescent pigments in lipstick/lip gloss applications in Europe and Japan. MIRAGE Glamour Sapphire contains ferric ferrocyanide, which is not permitted for lip/oral area products in US.

VISIONAIRE metallic pigments: Effect vs. particle size

Using VISIONAIRE pigments, different metallic effects can be achieved with the right combination of effect pigments and particle sizes. Pigments of small particle sizes (5-50 µm) create brilliant effects with very high coverage. Larger sized pigments create high luster (15-70 µm) or sparkle effects (20-95 µm) with characteristic metallic shine.

Table 6: Effect vs. particle size

Particle Size	Effect	Gold Effects	Silver Effects	Copper Effects
5 – 50 µm	Brilliant effects	VISIONAIRE Natural Gold VISIONAIRE Olive Gold VISIONAIRE Sunflower Gold VISIONAIRE Maize Gold VISIONAIRE Honey VISIONAIRE Amber	VISIONAIRE Silver Sea	VISIONAIRE Cinnamon VISIONAIRE Lava
15 – 70 µm	Bright effects	VISIONAIRE Bright Natural Gold VISIONAIRE Bright Sunflower Gold VISIONAIRE Bright Honey VISIONAIRE Bright Champagne	VISIONAIRE Bright Silver Sea	VISIONAIRE Bright Cinnamon VISIONAIRE Bright Lava
20 – 95 µm	Sparkling effects		VISIONAIRE Sparkling Silver Sea	

Adding color to loose or pressed powder products

All recommended effect pigments can be mixed with any other pigment such as pearlescent pigments, iron oxides and dyes for use in powder formulations. Especially the combination of metallic and pearlescent pigment can lead to surprising and unimagined brilliant color shades. Next to standard colorants, also colored metallic pigments can be used to provide color to powder formulations. In contrast to iron oxides, they will not only color the product but also provide a metallic brilliance.

Table 7: Visionaire Colored Pigments

Particle Size	Product
15 – 70 µm	VISIONAIRE Bright Red 7

Formulation remarks

Although metallic pigments show excellent compatibility with cosmetic raw materials used in powder formulations, some guidelines should be considered:

- It is recommended to use VISIONAIRE Copper and bronze powder effect pigments in water-free or silicone based systems (to avoid pigment oxidation).
- Generally the addition of antioxidants is recommended especially when vegetable oils are used.
- VISIONAIRE metallic pigments have a significantly lower oil absorption or unsaturated oils and are much easier to compact than pearlescent pigments.
- VISIONAIRE metallic effect pigments impart a highly luxurious sensory aspect, their unique cold metallic feel and easy gliding properties are inimitable in the field of cosmetic raw materials.

- **Consider color mixing rules:** Metallic pigments behave like absorption pigments, they mix subtractively, because the visible color is the non-absorbed portion of light. A mixture of yellow and blue is green – a mixture of all colors is black.
- For all applications the same rule applies: VISIONAIRE pigments with particle sizes of 5-50 µm and 15-70 µm provide metallic shine and high coverage.

Table 8: Recommended pigmentation in powder formulations:

<i>Finished Product</i>	<i>Level of use:</i>
Pressed Powder	20 – 45 %
Loose Powder	5 – 100 %

Physical Properties

- VISIONAIRE Aluminum pigments can be heated up to < 160 °C.
- VISIONAIRE Colored and VISIONAIRE Copper/Bronze pigments should be kept < 100 °C.
- VISIONAIRE Aluminum pigments can be used in the pH-range between 4 -8.
- VISIONAIRE Colored pigments can be used in the pH-range between 4,5-7,5.
- VISIONAIRE pigments are not sensitive to light exposure (exception → VISIONAIRE Colored have a lower light stability than other metallic effect pigments)

Regulatory limitations

No limitations for aluminum and bronze/copper pigments in Europe and Japan.

Aluminum pigments are not permitted for use in lip/oral applications in USA.

VISIONAIRE Bright Red 7 is not permitted for eyes and lips in USA due to presence of Red 7.

VISIONAIRE Sparkling Silver Sea is not permitted for eyes applications (according to 21CFR73.2645) due to particle size restrictions.

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