

Formulation guidelines for formulating effect pigments in water based gels

For water based gel applications, the choice of effect pigments comprises the SYNCRYSTAL pearlescent pigment range and the MIRAGE pearlescent 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 very low. 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 average 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) create sparkling or dazzling effects, combined with very high brilliance and transparency.

Table 1: SynCrystal pearlescent pigments: Effect vs. particle size

Particle Size	Effect	Silver effects	Interference effects
10 – 50 µm	Bold and strong pearl effects	SynCrystal Silver	SynCrystal Gold SynCrystal Red SynCrystal Blue
20 – 150 µm	Pure sparkling effects	SynCrystal Sparkling Silver	

Combinations with other raw materials

All recommended effect pigments show excellent compatibility with other cosmetic raw materials for use in water based gel formulations.

Formulation remarks

Although pearlescent pigments show excellent compatibility with cosmetic raw materials used in water based gel applications, some guidelines should be considered:

Table 2: Recommended pigmentation in different gel types:

Finished Product	Level of use (transparent system)	Level of use (opaque system)
Hair styling gel	0.1 – 0.5 %	1 – 3%
Hair coloring gel	3 – 7 %	3 – 7 %
Shower gel	0.05 – 1%	1 – 3 %
Eye shadow gel	3 – 5 %	15 – 20 %
Skin gel	0.1 – 1 %	1 – 5%

For all applications the same rule applies: The SynCrystal pigments are used to create strong pearly shine and to achieve higher color purity. SynCrystal pearl pigments show a achromatic bulk color and due to the high opacity covers inhomogeneities as clouding in transparent systems.

Physical Properties

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

Regulatory limitations

No limitations for SynCrystal pearlescent pigments in face/body gel applications worldwide.

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 both an attractive sparkle 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>Red brown to gold 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 water based gel formulations

The MIRAGE pigment range will add luxury sparkling and glitter effects especially to clear systems. Thanks to their reflectivity, MIRAGE pigments will offer a higher brilliance and gloss compared to other pearlescent pigments. Due to their synthetic origin, MIRAGE pigments show a neutral white powder color which is specially interesting and advantageous for transparent systems like water based gels. 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 with very low use levels, combined with other colorants the use level has to be increased.

Procedure

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

General rules:

- **Avoid grinding and milling of effect pigments:** If the mechanical stress to the pigments is too high, the pigment particles might break or the metal oxide layer might be removed from the mica platelets, resulting in loss of lustre or change in shade. The effect pigments always disperse very well without any grinding due to their large particle size and the virtual absence of agglomeration.
- **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.

Formulation remarks

Although pearlescent pigments show excellent compatibility with cosmetic raw materials used in water based gel applications, some guidelines should be considered:

Table 4: Recommended pigmentation in different gel types:

Finished Product	Level of use (transparent system)	Level of use (opaque system)
Hair styling gel	0.01 – 0.5 %	1 – 3%
Shower gel	0.01 – 1%	1 – 3 %

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.

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 ECKART GmbH E-mail: info.eckart@altana.com
 ECKART Cosmetic Colors LLC E-mail: info.eckart.usap@altana.com
www.eckart.net

ECKART Asia Limited
 E-mail: info.eckart.asia@altana.com