

## Formulation guidelines for formulating effect pigments in water based gels

For water based gel applications, the choice of effect pigments comprises the PRESTIGE® pearlescent pigment range and with some exceptions the VISIONIARE® metallic pigment range. The use of both pigment ranges and their optical properties are described as follows:

### Pearlescent Pigments: Effect versus particle size

Different coloring effects can be achieved with the right choice of effect pigments depending on their particle size. Small particles (< 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 particles (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**

<b>Particle Size</b>	<b>Effect</b>	<b>Silver and subtle shimmer effects</b>	<b>Gold to redbrown effects</b>
1 – 15 µm 5 – 25 µm	Silk effects	PRESTIGE® Soft Silver PRESTIGE® Silk Silver PRESTIGE® Silk Interference Pigments	PRESTIGE® Soft Bronze PRESTIGE® Soft Copper PRESTIGE® Soft Fire-red PRESTIGE® Soft Beige
10 – 50 µm	Strong pearl effect	PRESTIGE® Silver PRESTIGE® Interference Pigments	PRESTIGE® Bronze PRESTIGE® Copper PRESTIGE® Lemon Gold PRESTIGE® Summer Gold PRESTIGE® Autumn Gold
15 – 70 µm	Bright effects	PRESTIGE® Bright Silver PRESTIGE® Bright Interference	PRESTIGE® Bright Bronze PRESTIGE® Bright Copper PRESTIGE® Bright Fire-red PRESTIGE® Bright Lemon Gold PRESTIGE® Bright Summer Gold PRESTIGE® Bright Autumn Gold
20 – 150 µm	Sparkling effects	PRESTIGE® Sparkling Silver PRESTIGE® Sparkling Interference	PRESTIGE® Sparkling Lemon Gold PRESTIGE® Sparkling Pure Gold
20 – 250 µm	Dazzling effects	PRESTIGE® Dazzling Silver	PRESTIGE® Dazzling Red Gold

### Combinations with other raw materials

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

### 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. They can be added to the powder system while stirring after milling of the organic/inorganic pigments and before the binder is added.
- **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:

- Pigments containing carmine or ferric ferrocyanide are facing stability problems in water based products and are not recommended for water based gel formulations.

**Table 2: Recommended pigmentation in different gel types:**

<i>Finished Product</i>	<i>Level of use:</i>	<i>Recommended pigments</i>
Hair styling gel	0.01 – 0.1 %	PRESTIGE® Sparkling
Hair coloring gel	3 – 5 %	PRESTIGE®range
Shower gel	0.01 – 0.05 %	PRESTIGE® Sparkling PRESTIGE® Dazzling
Eye shadow gel	15 – 20 %	PRESTIGE® Bright PRESTIGE® Sparkling
Skin gel	0.05 – 0.1 %	PRESTIGE® Bright PRESTIGE® Sparkling

For all applications applies the same rule: PRESTIGE® Soft range and PRESTIGE® Silk range are used to create pearly shine and achieve high coverage. The PRESTIGE® Bright range, PRESTIGE® Sparkling range and PRESTIGE® Dazzling is used for high brilliance and transparency.

**Regulatory limitations**

No limitations for pearlescent pigments in face/body gel application in EU/Japan. PRESTIGE® Sapphire, PRESTIGE® Emerald, PRESTIGE® Amethyst and PRESTIGE® Obsidian contain ferric ferrocyanide, which is not permitted for lip products in the USA.

### Metallic Pigments: Effect versus particle size

Different metallic effects can be achieved with the right choice of effect pigments depending on their particle size. Smaller particles (5-50 µm) create brilliant effects with very high coverage. Larger sized particles create high luster (15-70 µm) or sparkle effects (20-95 µm) with characteristic metallic shine.

**Table 1: Effect versus particle size of recommended pigments**

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

### Combinations with other raw materials

VISIONAIRE® copper and gold effect pigments are not compatible with carbomers or similar type polymers which require neutralization. There are different other jellifying agents or pre-neutralized thickeners that can be used in combination with those Visionaire pigments like Ammonium Acryloyldimethyltaurate/ VP Copolymer or Dehydroxanthan Gum.

### Formulation remarks

For stable water based formulations, some guidelines should be considered:

- VISIONAIRE® Bright Champagne and VISIONAIRE® Silver Sea should not be used in water containing systems.
- For best results, add the Visionaire metallics to the alcohol, glycol, or any other water miscible solvents if present, before mixing into the water phase.
- pH- value adjustments can greatly impact the stability. It is recommended to use pre-neutralized thickeners to avoid neutralization. If pH-adjustments are necessary use diluted base, preferably AMP (aminomethyl propanol) or secondary amines to increase the pH-value or diluted acid e.g. citric acid to decrease the pH-value.
- The neutralizing agent should be added slowly to the formulation.

## Procedure

A few basic rules need to be considered in formulations containing metallic 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 SiO<sub>2</sub> layer might be removed from the pigment surface, resulting in loss of brilliance. The effect pigments always disperse very well without any grinding due to their large particle size and the virtual absence of agglomeration. They can be added to the powder system while stirring after milling of the organic/inorganic pigments and before the binder is added.
- **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.

### 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® Sparkling Silver Sea is restricted in use in the USA due to particle size of > 75 µm.

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