ChromaFlair®
COLOR SHIFTING PIGMENT

VIAVI Solutions

Application Note

Plastic Application Guidelines

ChromaFlair® light interference pigment is composed of very flat, smooth flakes with an average aspect ratio of 12:1 and is highly reflective and specular.

These two attributes lead to the high chromaticity and hue shifts that characterize ChromaFlair pigment. The median of particle size distribution of ChromaFlair pigment is between 11.0 and 13.0 µm with less than 1% of the pigment greater than 35.19 µm.

The pigment is inorganic in nature and is composed of three common raw materials: aluminum, magnesium fluoride and chromium. Propylene glycol n-propyl ether is used as a wetting agent to reduce dusting during weighing and mixing of the pigment.

All eight standard colors of ChromaFlair pigment are manufactured from the same three raw materials. All colors have an aluminum metal core. This highly reflective layer serves two purposes. It provides the reflective surface necessary for light interference, which produces the highly chromatic color shift characteristic of ChromaFlair pigments. Secondly, the reflective aluminum layer provides hiding by reflecting light prior to reaching the substrate.

Polymer Systems

ChromaFlair pigment has been most successful when used with clear resin systems. The color saturation and color travel are greatest when a clear resin is used in combination with a smooth, high gloss part finish. HDPE and other translucent resins may also be used. However, the resulting part will exhibit a more understated color effect. Matte finish part designs will reduce the color shift and typically require higher pigment loading. The following generic polymer systems have been successfully used in molding applications with ChromaFlair pigment:

- Polycarbonate (PC)
- Polypropylene (PP)
- High Density Polyethylene (HDPE)
- Thermal Polyurethane (TPU)
- Polyethylene terephthalate (PET)
- Acrylonitrile Butadiene Styrene (ABS)
- Styrene Acrylonitrile (SAN)
- Cellulose Acetate (CA)
- Natural Rubber
- Nylon 12

Application Methods

Many technologies exist to manufacture and decorate plastic molded parts. ChromaFlair pigment has been tested in many of these applications including:

- Injection Molding
- Extrusion Blow Molding
- Film Extrusion
- In-mold Decorating
- Thermoforming
- Calendering
- Reactive In-mold Coating

Masterbatch production using twin screw, co-rotating extruders and Banbury mixers has been tested with ChromaFlair pigment and has proven more robust when processed under these conditions than mica and aluminum flake. Parts molded in multiple passes using 100%recycle show little color and particle size change. If you are currently molding with micas, consider those process conditions as a reasonable starting point.

As with other flake pigments, flow lines must be considered with ChromaFlair pigment. For new tool designs, location of the gate must be considered to minimize the presence of flow lines as well as conceal their appearance. Some processes such as film insert molding and in-mold decorating can completely eliminate the presence of flow lines and deliver an excellent quality appearance at a fraction of the cost of painting.

Loading

The amount of ChromaFlair pigment required to generate a strong color effect is dependent on many factors.

- Part Geometry
- Resin
- ChromaFlair Color
- Wall Thickness
- Part Surface Gloss
- Presence and level of other pigments

A starting point for the amount of ChromaFlair pigment to be added is outlined in Table 1. The loading level can be varied to achieve the desired look and economics.

Color	Loading	Relative Thickness
Gold/Silver	0.22%	1.00
Red/Gold	0.25%	1.14
Magenta/Gold	0.26%	1.17
Purple/Orange	0.28%	1.27
Blue/Red	0.29%	1.32
Cyan/Purple	0.43%	1.97
Green/Purple	0.50%	2.27
Silver/Green	0.57%	2.62

Table 1. ChromaFlair Pigment Loading

The most economical method to establish loading for a particular part design and resin system is to establish the loading required for the desired effect using one ChromaFlair pigment color. Once the loading for one color is established, other levels of ChromaFlair pigment loading can be estimated using the relative flake thickness as reported above as a proportioning guide.

With the use of multi-layer blow molding and sheet extrusion, the amount of ChromaFlair pigment can be further reduced. A light loading is used in the outer layer backed by an opaque inner layer. The inner layer can be black or colored to complement the ChromaFlair pigment color used. For these applications, the ChromaFlair pigment level is recommended at three times the level reported in Table 1.

As a general rule, mass pigmentation of a molded part is more economical than painting. With loading as low as 0.10%, highly saturated colors exhibiting color performance that matches painted parts can be achieved. Figure 1 shows the color travel of a chip molded in SAN (styrene acrylonitrile) with Cyan/Purple 230 with respect to a sample painted with a standard base coat/clear coat paint system. The loading used for the plastic part was 0.36% and the loading used for the painted part was 10%.

The amount of ChromaFlair pigment may be further reduced by the addition of a small amount of carbon black. Figure 2 shows the color travel of a series of chips molded in SAN with Red/Gold 000. Four levels of ChromaFlair pigment were evaluated: 100% (masstone), 80%, 60% and 40% loading. The opacity of each chip was held constant by adding increased levels of carbon black. From this data, the cost of coloring a part can be reduced by 60%, while maintaining a strong color effect (see Table 2).

The formulations in Table 2 have been balanced to maintain constant light transmission. This is achieved by adding carbon black to offset the increase in light transmission as the ChromaFlair pigment concentration is reduced. To further modify the color shift, 0075 to 0.12% transparent organic pigments can be added to any of the above formulations.

ChromaFlair Pigment	100%	80%	60%	40%
Gold/Silver 080	0.22	0.18	0.13	0.09
Red/Gold 000	0.25	0.25	0.15	0.10
Magenta/Gold 330	0.26	0.21	0.16	0.10
Purple/Orange 300	0.28	0.23	0.17	0.11
Blue/Red 280	0.29	0.23	0.17	0.12
Cyan/Purple 230	0.43	0.34	0.26	0.17
Green/Purple 190	0.50	0.40	0.30	0.20
Silver/Green 060	0.57	0.46	0.34	0.23
Carbon Black	0	0.0025	0.005	0.0075

Table 2. ChromaFlair Pigment + Carbon Black Loading

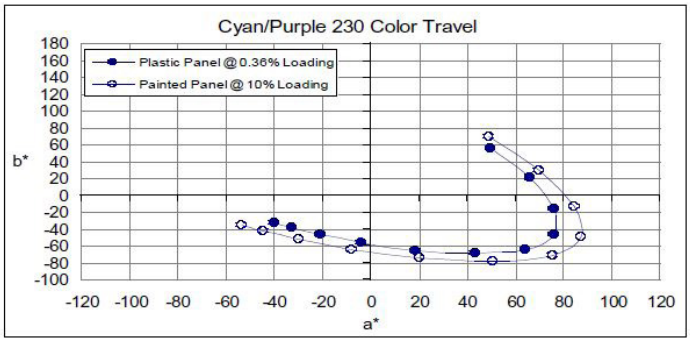

Figure 1. Color Travel of ChromaFlair Pigment Cyan/Purple 230

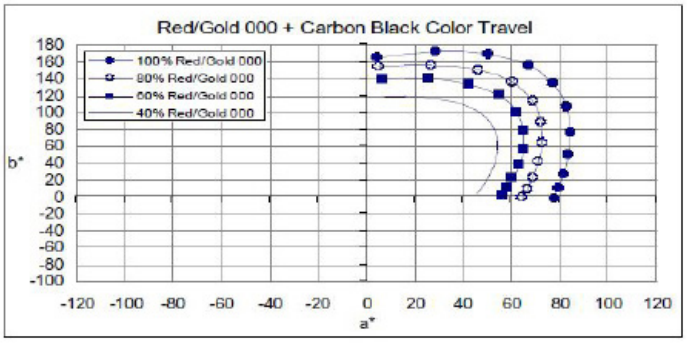

Figure 2. Color Travel of ChromaFlair Pigment Red/Gold 000 + Carbon Black

The information presented in this application memo is based on current data. Periodic updates are provided. Please see your ChromaFlair pigment representative for the most recent edition.

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