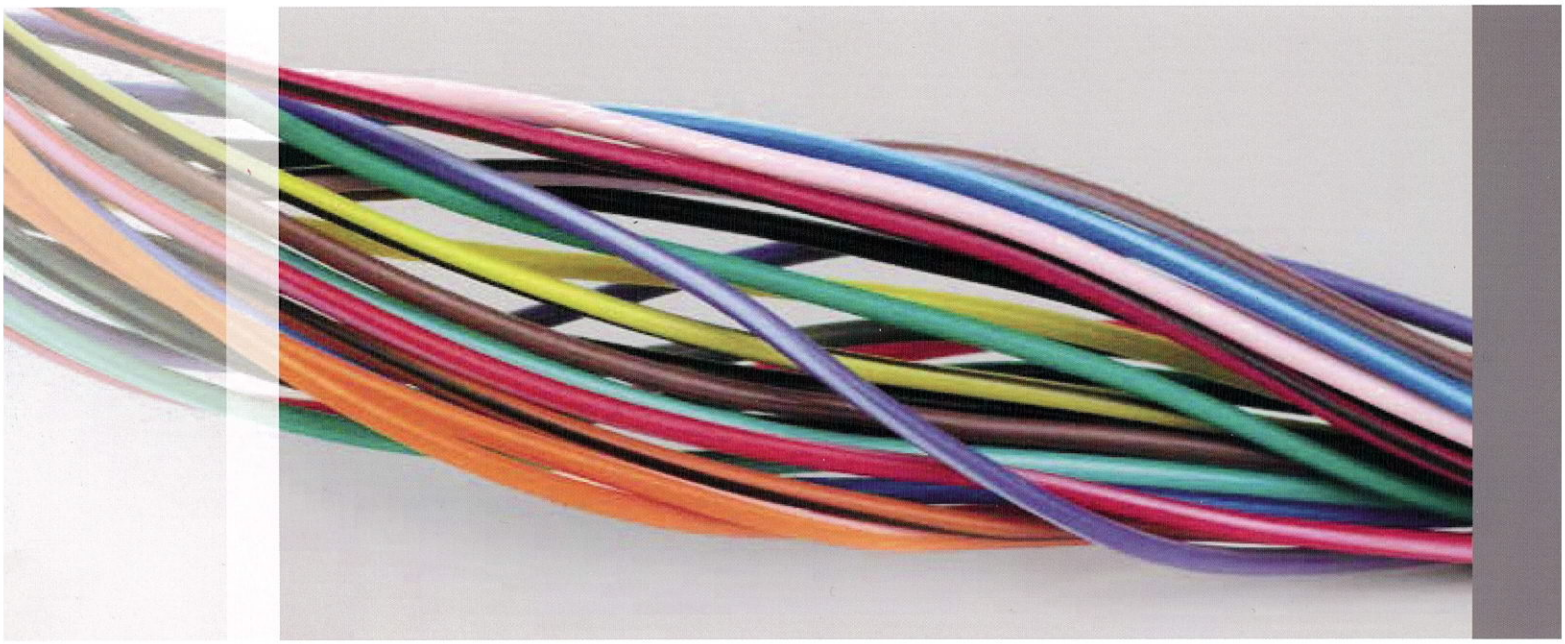
Colors and compounds for high temperature polymers

Colorant Chromatics

PolyOne™



Brief history

Colorant Chromatics was founded in Sweden in 1979 and started production of fluoropolymer concentrates in the owner's barn. Since then, we have opened manufacturing plants in Aland, Finland (1981), in Bethel, CT, USA (1983) and Shanghai, China (2003) and a distribution center in Limburg, Germany (1985). In 2013, our Headquarters were relocated to Eindhoven, The Netherlands. Since December 2011, Colorant Chromatics has been part of PolyOne Corporation (NYSE:POL) a premier provider of specialized polymer material, services and solutions.

Colorant Chromatics Group

Colorant Chromatics is the world's leading specialist in the enhancement of high performance polymers. We supply fluoropolymer and high-temperature thermoplastics based colorant and additive concentrates and compounds, dispersed pigments for coloring PTFE, as well as a full range of printing, striping and marking inks. Our global leadership position is based on a strong focus on customer needs, a deep understanding of the market and superior product quality. We continuously develop and enhance technologies that increase efficiency and improve overall cost of ownership for our customers. Whether you use color for esthetic or identification purposes, with additives to improve or modify physical properties, in quantities large or small, we have the right solution to meet your specific requirements.

We can help you to

- Increase production throughput
- Reduce waste and scrap materials
- Reduce inventory
- Match your exact specification
- Fast-track to ‚steady-state-production'
- Gain productivity
- Become more competitive

Vision, mission and values

Colorant Chromatics provides manufacturers of products made with fluoropolymers or high-temperature thermoplastics with effective solutions based on long-term relationships. We help our customers win in their markets.
We will deliver superior quality and technically advanced products, on-time and in full.

- We put customer needs first and foremost
- We do our utmost to ‚deliver to promise'
- We strive in all ways to maintain and improve the quality of our products while keeping costs reasonable
- We provide development support to help our customers with emerging product needs
- We operate a clean and well maintained facility
- We treat one another with respect and dignity
- We appreciate pluralism of opinions, cultures and attitudes
- We cooperate both internally and externally and are highly responsive
- We strive to find better and more efficient ways of operating
- We believe in and target ‚first-time-right' philosophy

A complete product portfolio

The Colorant Chromatics Group produces a full range of:

- color concentrates & precolored solutions
- specialty compounds
- additive concentrates
- dispersed pigments for PTFE
- printing and striping inks

for processors of high-performance plastics and fluorpolymers.

Fluoropolymers

Fluoropolymers distinguish themselves by their high melting points, and the corresponding high processing temperatures and continuous use temperatures, as well as their chemical resistance and electrical properties. The characteristics that make fluoropolymers so valuable also make it challenging to color them and to improve their functionality. Success requires specific knowledge of heat stable pigments and additives. Colorant Chromatics has tremendous experience in selecting the best pigments and additives for optimal performance under demanding circumstances.

Major fluoropolymers processed include: FEP, ETFE, PFA, MFA, ECTFE, PVdF, THV, PTFE

High temp solutions/injection molding

Sitting atop the plastics pyramid, high performance polymers are the right choice for manufacturers of applications that must withstand grueling conditions or meet the strictest safety regulations. These materials keep sensitive medical devices operating, work to ensure passenger safety in airplanes, withstand the heat and chemicals of factories or underhood automotive applications, and much more.

Minimum order quantities for color concentrates for high-performance polymers are as low as 10lbs (5kg), enabling you to better manage inventory and order only what you really need. Or let us design your compound to meet your application's specifications. We have mastered the art of coloring these materials, and know how to enhance their functionality with laser marking additives, conductive materials, radiation cross-linkable solutions, glass fiber and other reinforcing materials, and additional value-add offerings such as infrared filtering.

High-performance polymers processed include: PEEK, PAEK, PEKEKK, PEI, PES, PSU, PPSU, PPS

Markets and applications

Colorant Chromatics supplies its full range to processors of:

- Wire and cable
- Hoses, pipes, fittings and tubing
- Injection molded parts
- Fibers and monofilaments
- Films and Tapes
- Stock shapes

Processors are using high temperature polymers and fluoropolymers in particular when one or a combination of the following properties is required:

- Outstanding electrical performance
- Permanent high temperature resistance
- Chemical resistance
- Flame retardancy
- UV inertness
- Low friction

Our customers supply products to the following industries:

- Aircrafts and aerospace: wire and cable systems, films, tapes, molded parts
- Automotive and trucks: wire and cable systems, tubes, fuel hoses
- Chemical industry: wire and cable, pipes and fittings, pump housing
- Medical devices: molded parts for dental tools, catheters, tubing for cardioscopy, pacemakers
- Electrical and electronics: wire and cable systems, molded parts, tapes
- Communication: plenum cables, connectors
- Textiles: filaments, fabrics
- Construction and Architecture: films, pipes and fittings

Color concentrates & precolored solutions

Colorant Chromatics offers color and additive concentrates in various strengths and in different viscosities of carrier resins to suit the manufacturing process. They are offered in the company's standard color line, as well as different Munsell and RAL standards. The company also offers special services such as custom color design or combination concentrates containing color and additive.

COLORS

- A range of standard colors is available in various concentrate strengths
- Colors can be designed upon request using Pantone, Munsell, RAL color standards or manufactured part
- Customized pigment loadings can be provided to address specialized coloration needs
- Laser markable colors can be offered
- For sensitive applications, like medical and food, a solution can be offered compliant with related regulations
- All colors are based on heavy metal-free pigments

Color concentrate selection must take into account the following extrusion design requirements for the following typical applications:

PRIMARY WIRE INSULATION

- Wall thickness
- Conductor size and color
- Line speeds
- Processor screw design
- Insulation electrical requirements

WIRE AND CABLE JACKETING

- Wall thickness
- Processor screw design
- Laser Markability

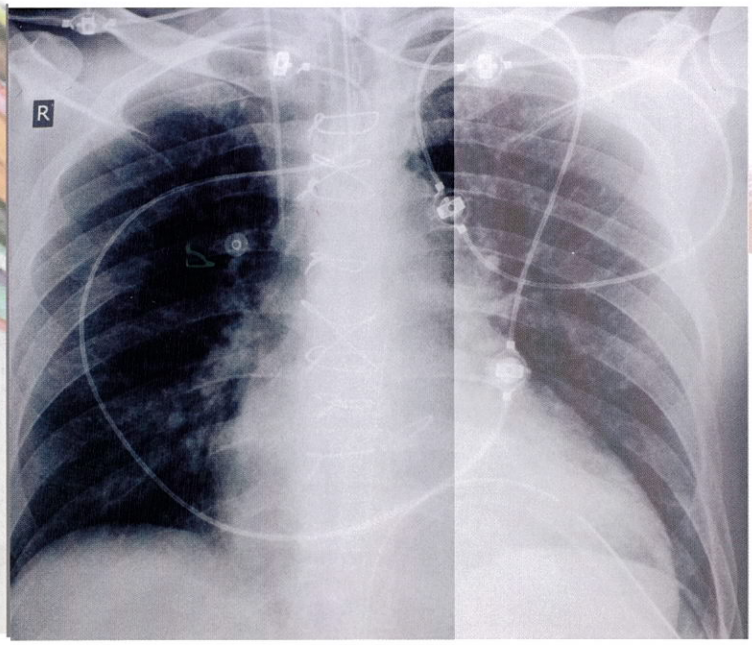
FILM, TUBING AND PROFILE SHAPES

- Desired opacity or translucency
- Wall thickness
- Extrusion dwell time and processing temperatures

INJECTION MOLDING

- Desired opacity or translucency
- Part size and wall thickness

Concentrates for: FEP, ETFE, PFA, MFA, ECTFE, PVdF, THV, PEEK, PAEK, PEKEKK, PEI, PES, PSU, PPSU, PPS, Thermoplastic PTFE



Specialty compounds

Colorant Chromatics offers specialty compounds with property enhancements such as:

- mechanical strength
- static dissipation
- X-ray opacity
- electrical performance

Value-added solutions include:

RADIATION CROSS-LINKABLE COMPOUNDS

By blending in a combination of special additives, high-temperature functional compounds can be cross-linked when exposed to electron beam radiation. Colorant Chromatics cross-linked formulations offer reliability and consistent quality for the high-end aerospace industry. Improved cut-through resistance, abrasion resistance and mechanical toughness are all features of this product range.

ELECTRICAL CONDUCTIVE & ANTISTATIC COMPOUNDS

Where static dissipation and controlled conductivity are critical, Colorant Chromatics functional compounds can meet the requirements of high-temperature applications, such as wire and cable and injection molded parts for the petroleum and chemical processing industries.
Controlled dispersion and high-quality carbon black materials enable you to achieve optimal performance for high-temperature extrusion and molding processes. Processing aids can be used to achieve an improved surface finish, expanded heat processing window, elimination of die drool and higher line speeds.

FIBER REINFORCED COMPOUNDS

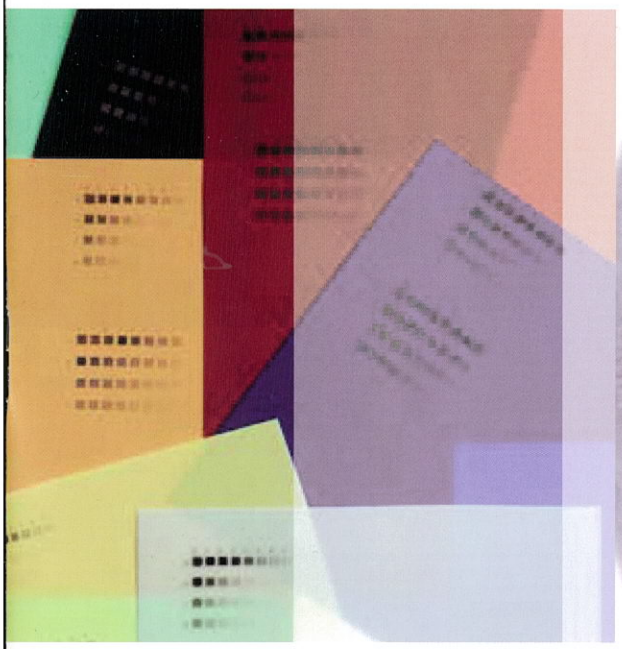
Colorant Chromatics offers the following reinforced high-temperature polymer and fluoropolymer functional compounds, which can be further modified for specific color, tensile or elongation properties.
Carbon/Graphite Fiber compounds can help you increase the mechanical strength properties of your injection molded parts with increased flex modulus.
Glass Fiber and Glass Beads formulations are typically used for injection molding processes where improved dimensional stability is required.
Titanate Fiber Compounds can increase mechanical strength while gaining chemical inertness and excellent cryogenic impact resistance.

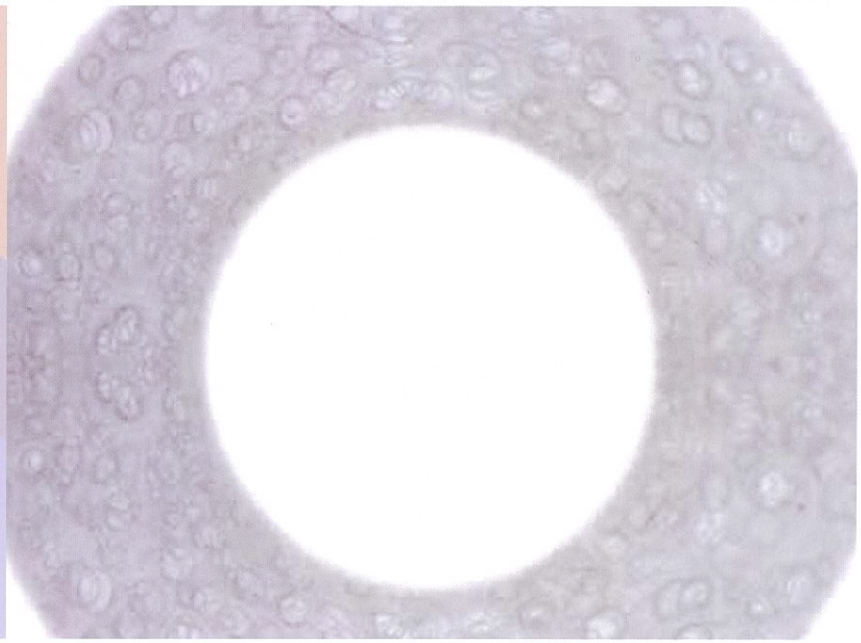
X-RAY OPAQUE COMPOUNDS

Colorant Chromatics X-Ray Opaque functional compounds contain various fillers such as barium sulfate and bismuthtrioxide that are visible upon exposure to X-Ray (radiopaque). These compounds offer a combination of chemical inertness, high temperature stability that supports sterilization processes, and excellent sliding properties inherent with fluoropolymers.

Direct R & D support is also available for customers who need specialist support for their engineering requirements with customized products.

Compounds for: FEP, ETFE, PFA, MFA, ECTFE, PVdF, THV, PEEK, PAEK, PEKEKK, PEI, PES, PSU, PPSU, PPS, Thermoplastic PTFE





Additive Concentrates

The additive concentrates developed by Colorant Chromatics enhance the performance of your parts, improve your manufacturing efficiency, reduce manufacturing downtime, and enable smooth product transitions.

Collaborate with us to define a solution that provides your parts with the added value they need to realize peak performance.

The additive concentrate porfolio from Colorant Chromatics can provide solutions with additional functionality such as:

- improved lubricity
- lightweighting through foaming, by both physical and chemical foaming
- heat reduction through SiteCool™ infra-red absorption additive for applications
- laser marking solutions
- achitectural film

or other added-value properties.

CHEMICAL FOAMING ADDITIVES

Colorant Chromatics chemical foaming solutions for fluoropolymer wire insulation can reduce part density while enhancing the stability and efficiency of the manufacturing process, without the need to invest in additional equipment for physical foaming with blowing agents. This advanced additive also enables customers to preserve electrical properties while reducing insulation thickness and raw material consumption through a consistent closed cell structure. These chemical foaming solutions for fluoropolymer wire insulation are suitable for FEP, PFA and MFA polymers and are available globally.

PHYSICAL FOAM CONCENTRATES

Colorant Chromatics Foam Concentrates for foam processes with blowing agents, provide a concentrated level of nucleating agent to optimize the cell structure in a foamed resin. Foamed polymers provide enhanced electrical properties, reduced cable weight, and material cost savings.

LASERMARKING

Driven by security and product traceability needs, laser marking of high-temperature polymers is becoming more common as processors strive to overcome the limitations of ink printing, hot stamping or other labeling processes. Laser marking additives are added to polymers, such as fluoropolymers, that do not readily absorb the wavelength of laser light.

SITECOOL™

SiteCool™ is an additive solution for fluoropolymer architectural film to reduce the transfer of heat into the interiors of constructions by absorbing infrared energy contained within the solar spectrum. Applied in fluoropolymer films, SiteCool™ additive solutions help reduce the amount of energy required to cool stadiums, shopping malls, and other large indoor facilities.

Dispersed pigments for PTFE

DISPERSIONS FOR PTFE COLORING

Dispersed Pigments for coloring PTFE are designed to add color to PTFE parts manufactured by the PTFE fine powder paste extrusion process. In order to extrude PTFE insulated wire and tubing, a lubricant (normally naphtha) must be blended with the PTFE fine powder. Extrusion of colored PTFE insulation is done by incorporation of dispersed pigments in same lubricants. These dispersions also contain additives, making both the pigment dispersion and the PTFE paste material more compatible.

To withstand the high temperatures of the sintering step in the PTFE process, you can rely on Colorant Chromatics to select the appropriate heat-stable pigments.

COLORS

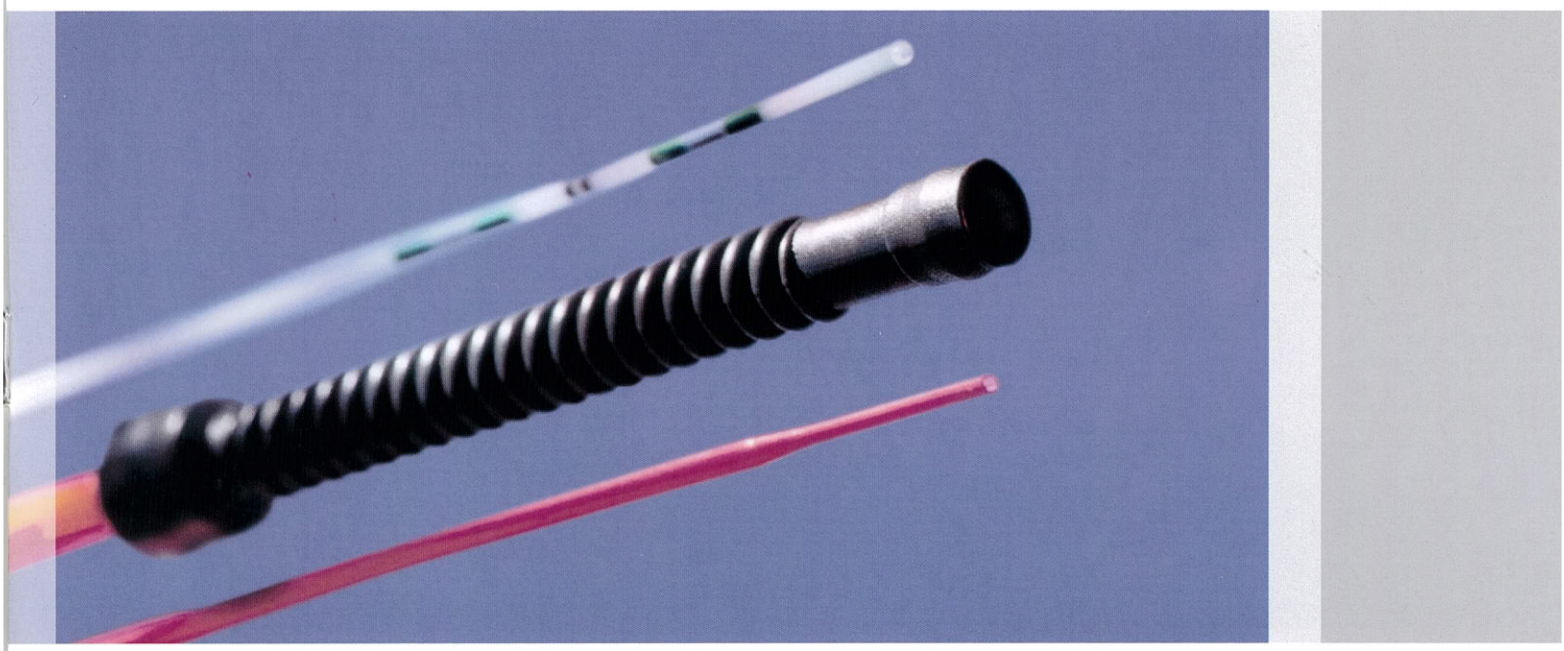
- A range of standard colors is available
- Colors can be designed upon request using Pantone, Munsell, RAL color standards or manufactured part
- Laser markable colors can be offered
- For sensitive applications, like medical and food, a solution can be offered compliant with related regulations
- All colors are based on heavy metal-free pigments

Let-down ratios and specific processing suggestions are provided in the product data sheet available from your local sales office.

APPLICATIONS:

- PTFE wires & cables
- PTFE tubes
- PTFE tapes
- PTFE yams
- PTFE dental floss thread

By using Colorant Chromatics dispersed pigments, the processing of colored PTFE will become simpler and the risk of contamination during blending of dry pigments will be eliminated. In addition, a more homogenous color distribution and intentse color shade in the end product can be achieved.
Dispersable pigments for laser marking also are available.



Printing and striping inks

Colorant Chromatics provides inks used for striping and offset printing of fluoropolymer and other high temperature resin insulation.
Inks for: FEP, ETFE, PFA, ECTFE, PVdF, Polyimide, PTFE, PEEK

- standard colors or customized design
- All colors are heavy metal free

HIGH TEMPERATURE PRINTING AND STRIPING INKS

These are aqueous inks used for printing, striping or top coating on high temperature resins. They feature a high temperature resin binder to hold the pigment in place after sintering and are sold as water dispersions. There are two families of high temperature inks:

- PTFE and
- FEP inks for printing, striping or top coating on insulated wires or tubing. Because of the thermal similarities of the resins they can also be used on PFA substrates.

LOW TEMPERATURE PRINTING AND STRIPING INKS

These are aqueous/alcoholic inks used for printing, striping or top coating on lower temperature substrates. They feature a synthetic resin binder to hold the pigment in place after sintering. These should be used on ETFE, E-CTFE or PVdF substrates.

PROCESSING

Printing and striping inks can be applied via offset printing, using a bath-and-wheel process, by air brushing, or by top coating on the substrate followed by a drying step to evaporate the water, and by a sintering step to bind the pigments to the surface. In some cases it is advisable to pre-treat the substrate prior to application.

COLORING PTFE/FEP DIPCOATING

Colorant Chromatics Inks can also be used to color aqueous PTFE- or FEP dispersions for full coverage coatings of wire & cable by dip coating applications.

Low Noise Dispersion (LND) Coatings for PTFE and FEP

These are aqueous dispersions used to coat low noise coaxial cables with dielectric cores of either PTFE or FEP. The dispersions function as a shielding, which reduces the influence of outside radiation and RF noise in coaxial cables when they are in motion (e.g. EKG sensor cables). They can also be used as an antistatic coating on FEP or PTFE impregnated glass cloth or resistance carrier for heating bands. They are applied by dip coating followed by sintering.

Color design: Your path to success

Getting to the right color formulation requires insight into the application and the environment in which it will be used.
Benefit from our experience in the art of coloring fluoropolymers. Collaborate with Colorant Chromatics to determine how to best color fluoropolymers or high-temperature polymers.

QUESTIONS WE WILL ASK INCLUDE:

What are the key requirements of the application? The requirements of the application will define not only which material should be selected, but also will guide the development of the appropriate color concentrate or compound.
Wire insulation, for example, requires a very different solution than film, tubing or profile shapes. Dependent on the design of the application, the polymer can exhibit very different properties in terms of heat and chemical resistance. This variability will greatly influence the pigment selection process.

FUNCTIONALITY

What functionality does your application require? Fluoropolymers and high-temperature polymers bring with them very special properties. But sometimes your application calls for additional functionality such as conductivity, improved lubricity, static dissipation, X-ray opacity, light weighing through foaming, or other criteria. It is important near the beginning of your design process to consider which functionality the final part should possess.

Part size and wall thickness: These measurements are important in material selection no matter which polymer you require, but even more so with fluoropolymers. Understanding this allows a color concentrate to be designed with the appropriate pigment strength, particle size and dispersibility. Get these three right and you greatly increase your odds of achieving uniform and repeatable product coloring performance.

OPTIMIZE PROCESSING

An experienced supplier of colorant and additive concentrates understands how to help you process these materials to make the best use of their unique characteristics while also optimizing your manufacturing efficiency.

We can formulate color concentrate in a standard range or matched to any reference chosen (RAL, Pantone or a manufactured part). We can even develop a color masterbatch formulation with the appropriate pigment particle size and loading to enable translucent colors.

RESINS FROM WORLD'S LEADING SUPPLIERS

Colorant Chromatics color concentrates and compounds are based on resins from the world's leading suppliers. Contact us about your application needs, and we will collaborate with you to formulate the best solution for your challenges.

Product stewardship

Colorant Chromatics product stewardship is designed to enhance our company's business conduct consistent with applicable regulatory requirements and industry standards. Our team of professionals has a deep working knowledge of major, global product regulatory compliance programs and special market requirements.

At Colorant Chromatics, we are focused on providing our customers with the highest levels of service and are dedicated to meeting our customer's need for regulatory support and global regulatory compliance. We continually monitor global regulations to stay current with the needs of our customers.

OUR CUSTOMER SUPPORT ACTIVITIES INCLUDE:

- Food and Drug Administration (FDA) compliance support
- Compliance with National Inventories
- REACH – European Legislation on Registration, Evaluation, Authorization and Restriction of Chemical.
- Restriction on Hazardous Substances (RoHS) and Waste Electrical and Electronic Equipment (WEEE) electronics compliance
- Data entry into the International Material Database System (IMDS)
- Hazardous Communication including safety data sheets (SDS) and labeling

GENERATING REGULATORY COMPLIANCE DOCUMENTATION INCLUDING:

- California Proposition 65
- European Food Contact
- Individual Customer Restricted Substance lists
- Drug Master Files
- Medical Application Files
- Food and Drug Administration Certification
- Potable water certification

Contact us if you have questions or for specific information on your application's regulatory compliance requirements.

Colorant Chromatics

www.polyone.com/colorant-chromatics

Colors and compounds for high temperature polymers

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