

# Ingenia Technical Brief

## Introduction to Color Masterbatch

Color masterbatch is a concentrated mixture of pigments and/or dyes encapsulated in a carrier resin compatible with the base polymer. Pigments and dyes are used in masterbatches to impart color in plastic products. The use of masterbatches offers advantages during processing, such as uniform color dispersion, ease of handling, and improved color consistency. Typical dosage ranges from 1-5% depending on pigment strength and application.



## Typical Applications

Color masterbatches are frequently utilized in injection molding for the production of items such as toys, bottles, and automotive components. In blow molded plastic containers, color is often incorporated for aesthetic enhancement like shampoo and detergent bottles. Other extrusion based technologies, including films, pipes, cables, and profiles, also employ color masterbatches in conjunction with UV stabilizers for outdoor applications. Furthermore, color masterbatches find use in non-wovens, medical devices, and textiles across various industries.

## Types of Colorants

Organic Pigments	Inorganic Pigments	Dyes
Bright, vibrant colors	Duller / muted colors	Soluble in select polymers
Good transparency	High opacity	Transparent coloring
Lower heat and light stability	Excellent heat and light stability	Limited thermal stability

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## Choosing the Right Color Masterbatch

Selection of color is based on performance and application requirements such as UV exposure, chemical resistance and environmental exposure of the product. Careful consideration must also be taken to ensure materials meet required regulatory compliance. Some colors may need to be used in applications which require food contact safety (REACH/FDA), RoHS, etc. Color matching is a precise science that ensures that the optimal shade and opacity requirements are met. Performance of the color is also impacted by different processing methods. Differences in processing via injection molding, film, and extrusion result in unique requirements for color stability since there are differences in processing times and temperatures. In summary, all various competing requirements must be taken into account when formulating masterbatch solutions.

## Factors Affecting Performance

- Carrier compatibility- Selected carrier in the masterbatch must match the base polymer rheology for proper mixing.
- Pigment selection- Affects lightfastness, opacity, and chemical resistance.
- Processing conditions- High temperatures may degrade colorants.
- Additive interactions- UV stabilizers, flame retardants, and fillers may impact the color appearance.

Issue	Possible Cause	Suggested Solution
<b>Streaks or specs</b>	Poor distribution	Improve screw configuration or increase mixing
<b>Color variation</b>	Inconsistent dosing	Calibrate feeder, validate dispersion quality of masterbatch
<b>Yellowing</b>	Thermal degradation	Lower processing temperatures
<b>Migration</b>	Incompatible pigment	Recipe change