

KRITILEN®

Masterbatches for PET Bottles

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Technical Information

KRITILEN® masterbatches for PET bottles are concentrates of colorants or additives in a polymer carrier. They offer a convenient way of incorporating colorants or specialty additives in PET bottles offering good dispersion, which is essential for maximum coloring strength and performance.

Products and Applications

The basic product line consists of the following color masterbatches:

KRITILEN®	Color shade properties	Main application / PET articles
OFF-WHITE PET91540	Special off-white	milk bottles
YELLOW PET11256	Opaque lemon yellow	bottles
YELLOW PET11325	Opaque reddish yellow	containers / bottles
ORANGE PET21749	Strong orange	containers
ORANGE PET21768	Opaque orange	containers
RED PET30612	Transparent dark red	containers of any size
RED PET31339	Transparent and brilliant red	bottles
VIOLET PET35732	Semi-transparent dark bluish violet	bottles
BLUE PET41121	Transparent reddish blue	still water bottles
BLUE PET41815	Transparent blue	carbonated water bottles
BLUE PET41122	Transparent blue	spirit bottles
BLUE PET41182	Opaque metallic blue	cosmetic bottles
GREEN PET50919	Transparent green	refreshment drinks' bottles
GREEN PET51980	Opaque dark green	olive oil bottles
BROWN PET71766	Transparent brown	shampoo bottles
BROWN PET71623	Opaque brown	containers / bottles
SILVER PET81883	Opaque silver	containers / bottles

All above masterbatches contain raw materials, which comply with food approval regulations. Based on customer specific color requirements, PLASTIKA KRITIS colormatching department can develop alternative color shades.

Additionally, the basic product line includes the following food approved white and black masterbatches:

- a) **WHITE PP958:** It is a bluish white masterbatch containing 50% of a premium TiO₂ rutile coated grade in a special PP carrier. Its excellent dispersion and small pellet size makes it suitable for the coloration of opaque PET bottles, but it can also be used in injection molding or thermoforming applications.
- b) **WHITE PET634:** It is a milky white masterbatch containing 40% of a premium TiO₂ rutile coated grade in a PET carrier. It is proposed for use for PET bottles, injection molding and thermoforming applications.
- c) **BLACK PPA932P:** Black masterbatch containing 30% P type carbon black in a special PP carrier along with selected antioxidant package protecting the end application polymer from thermal degradation during processing and end use. It is proposed for use in opaque PET bottles, injection molded articles and thermoforming applications.
- d) **BLACK PET6302:** Black masterbatch containing 30% P type carbon black in a polyester carrier suitable for transparent PET bottles and thermoformed articles.

The production of PET bottles requires the use of specialty additive masterbatches, which enable the producer to optimize the process and improve the end product properties. PLASTIKA KRITIS S.A. has developed a broad range of such additive masterbatches:

e) **OB PET601:** It is an optical brightener, mainly used to eliminate the yellowish undertone of recycled PET and create brilliant and "clean" tint. Optical brighteners absorb the ultraviolet (UV) light at 340-390nm and re-emit this energy to the visible light spectrum at 240-260nm, producing a whitening effect in polymers. OB PET601 has a good thermal stability and is recommended for use at a let-down ratio of 0.1%-0.5%.

f) **SL PET6100:** It is a slip and anti-scratch masterbatch in PET carrier. It contains 10% of a unique additive for PET, which reduces friction on the end product surface. This leads to a range of end product improvements, such as improved stacking, de-nesting, scratch resistance, easier processing and 60% of mold release force.

SL PT6100 is distributed evenly throughout the polymer during the melt phase. During cooling, the molecules of active ingredient migrate to the surface, forming a thin lubricating layer. Its addition levels are typically 2%-3%. It contains raw materials, which complying with EU Directive 94/62/EC and FDA requirements.

Note: Kritilen SL PT6100, if added >5% at the end product, does not comply with the FDA legislation for indirect food applications (it refers to substances that may come into contact with food as part of packaging or processing equipment).

g) **SL/AB PET6200:** It is developed to improve the slip/ anti-blocking properties of PET products. It contains high quality synthetic silica which acts as a very efficient anti-blocking agent, while it does not affect the transparency of produced items. The recommended addition level of PT AB 6200 varies between 1.0%-1.5 % depending on the product thickness and on the required anti-blocking effect. This product complies with European Directives 10/2011 and 94/62.

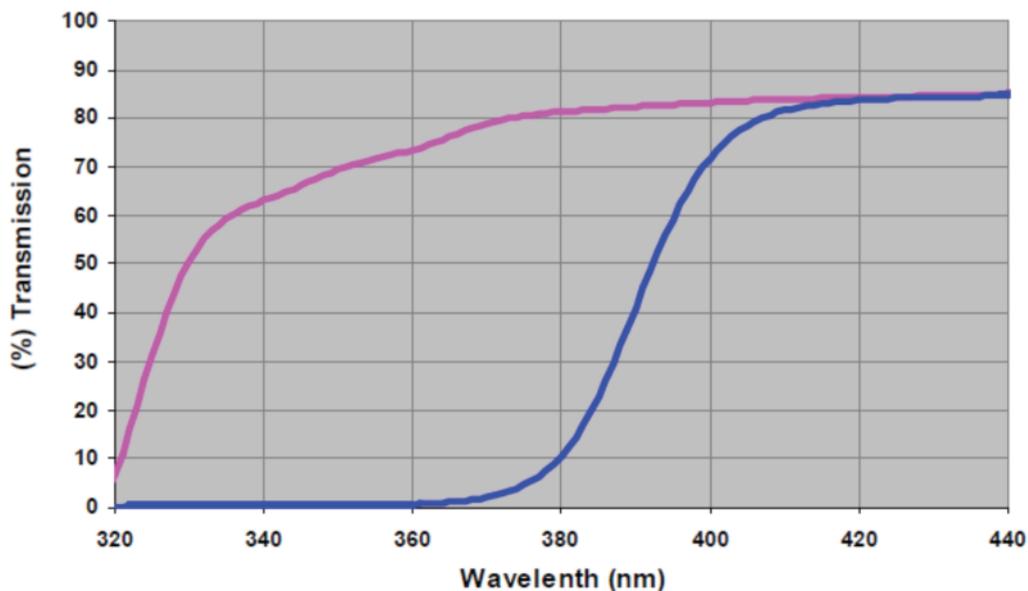
h) PET AB6105: It contains a polyether modified polysiloxane antiblock agent. It is designed for transparent PET thermoformed articles. The usual addition rate varies between 0.5%-2.0%. PET AB6105 doesn't impart any color to the final product. This product complies with European Directives 10/2011 and 94/62.

i) CE9126: It is chain extender masterbatch in PET carrier. It contains 15% of a multi-functional reactive polymer designed to reverse the degradation of PET. The active agent, included in this masterbatch recipe, is a polymeric coupling agent that reacts with degraded polymers to restore the original molecular weight, as well intrinsic viscosity and melt viscosity. This means that low quality recycled materials can be upgraded or that good quality ones can be treated more robustly. The proposed CE9126 addition rate is 1.5%-4.0%, depending on the recycled resin quality and proportion in the blend. Kritilen CE9126 should not be used at processing temperatures exceeding 300deg. Celsius. CE9126 reacts quickly. Its reaction will be over 99% complete, if at least 2min residence time is provided at 200deg. Celsius, in a well mixed system. Alternatively, 30 sec residence time at 280deg. Celsius will provide 99% completion. Kritilen CE9126 contains raw materials complying with EU Directives 2002/72/EC, 94/62/EC and FDA.

j) UV PET2330: This is a cost efficient masterbatch with 18% active ingredient. It could develop some slightly yellowish undertone in bottle. The UV absorber protects both the PET resin and the content. The usual addition rate of UV PT2330 is 1.5%-3% in PET items (i.e bottles).The addition rate depends on the application thickness and the performance requirements. The end processor must notice that the absorber contained in UV PT2330 is listed in Table 1 of Reg. 10/2011/EC with a Ref No 60400. In Table 2 of the above regulation, a SML of 30 mg/kg of food is applied.

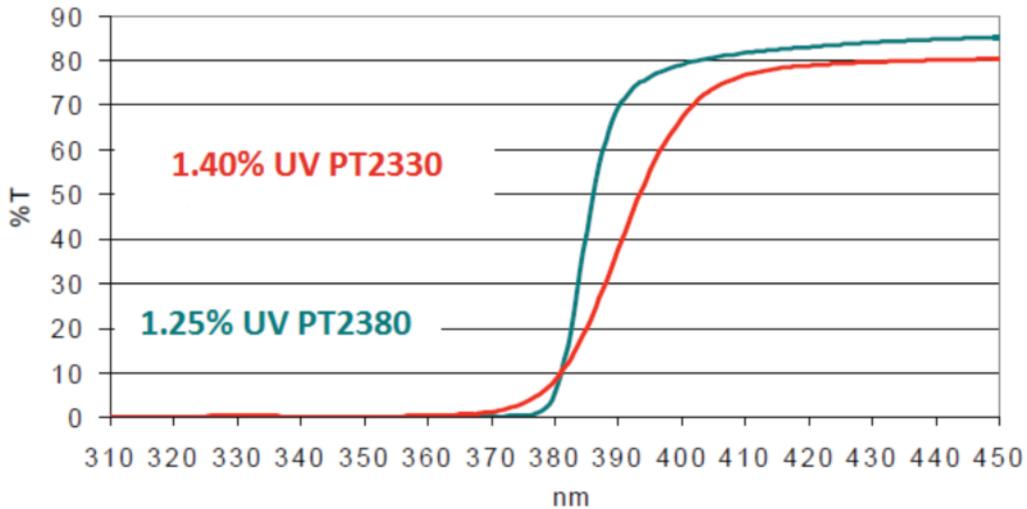
k) UV PET2320: It is a UV absorber masterbatch in a PET carrier, containing 15% of active ingredients. It is proposed for use in PET bottles, in order to protect the bottle content from degradation caused by the UV radiation. UV PT2320 contains raw materials complying with EU Directive 94/62/EC and BGA. Its indicative addition rate is 2%-4%.

The comparison of UV spectrum between a blank sample (in red line) and 1.33% UV PT2320 (in blue line) in a 0.25mm PET bottle is shown:



- l) UV PET2380: It is an advanced masterbatch which does not create yellowing of bottle, and it is more thermally stable than UV PT2320 and UV PT2330. UV PT2380 can be used in PET packaging in contact with dry, aqueous, acidic, alcoholic and fatty foods.

The following diagram presents the transmission spectrum of UV PT2380 versus UV PT2330 in PET bottles.



It is obvious that UV PT2380 is much more efficient and must be added at a lower let down ratio. UV PT2380 is food approved according to FDA (FCN No. 537) at a maximum addition rate of 20%.

Plastika Kritis masterbatches for PET bottles can be offered in standard pellets (with pellet diameter 2.5mm - 3.5mm) or micro granules (with pellet diameter 1.0mm - 1.5mm).