

K R I T I L E N[®] MASTERBATCHES FOR PLA

TECHNICAL INFORMATION

Polylactic acid or polylactide (PLA) is a biodegradable, thermoplastic, aliphatic polyester derived from renewable resources, such as corn starch or sugarcanes.

KRITILEN[®] masterbatches for PLA are concentrates of carbon black, TiO₂, CaCO₃, other pigments or additives in a PLA carrier. They offer a convenient way of incorporating these colorants or additives in PLA films, thermoforming or injection molded plastic products.

As the PLA carrier is compatible with the majority of the well known compostable polymers, the KRITILEN[®] masterbatches for PLA can be used in end applications, where such compostable polymers are present.

PRODUCTS

The basic product line consists of the following masterbatches:

Black / White / Filler masterbatches:

a) **KRITILEN[®] BLACK PL8430**

BLACK PL8430 contains 30% of a specially selected P type carbon black, having an excellent dispersion in a PLA carrier. It is proposed for use in PLA films, injection molding or thermoforming products.

b) **KRITILEN[®] BLACK BIO4419P**

BLACK BIO4419P contains 35% of a premium P type carbon black, being perfectly dispersed in a PLA carrier. It is proposed for mulch films, but can also be used in other end applications. BIO4419P can be used up to an addition rate of 10% in products of maximum thickness of 3.2mm, in order to be in compliance with EN 13432.

c) **KRITILEN[®] WHITE PL8150**

WHITE PL8150 contains 50% of a premium TiO₂ rutile coated grade in a PLA carrier. Its excellent dispersion makes it suitable for the coloration of films, but it can also be used in injection moulding or thermoforming applications.

d) KRITILEN[®] FILLER PL776

FILLER PL776 contains 60% of a premium calcium carbonate grade, which is perfectly dispersed in a PLA carrier. It can be used in PLA films, injection molding or thermoforming products.

Additive masterbatches:

e) KRITILEN[®] OB PL811

KRITILEN OB PL811 is an optical brightener masterbatch, which absorbs light in the UV-A range and re-emits it as blue light. This feature improves the appearance of the PLA products by masking the inherent “yellowish” tone and giving them a “clean” bluish shade. Typical addition rates of OB PL811 are 1% - 3%.

f) KRITILEN[®] SL/AB PL810

SL/AB PL810 is a slip and antiblocking masterbatch based on a PLA carrier. It contains a premium grade of synthetic silica, which does not influence the end product transparency, and a specially selected wax. It is proposed for use in a variety of thermoforming or injection moulding products. The recommended let down ratio is 2% - 4% in the end product recipe.

g) KRITILEN[®] AT PL815

AT PL815 is an antistatic masterbatch which combines both a fast effect and long-term antistatic performance, which is enhanced by a synergistic action of the additives contained. It is based on a PLA carrier and is proposed for use in films, injection moulding or blow moulding products. Typical let down ratios are 1%-2%.

h) KRITILEN[®] MSE PL820

MSE PL820 is a melt strength enhancing masterbatch. It is recommended for use in PLA for applications where improvements in melt strength and ease of processing ability are required. It widens the extrusion temperature window, decreases sag between die and downstream rolls, and enables extrusion and/or thermoforming of thinner sheets. MSE PL820 can increase the end product melt strength from 25%-100%, depending on let-down ratios used. Additionally, it can be used to compensate for losses in melt strength, when using high levels of regrind PLA or with insufficient drying of PLA. Typical let-down ratios range from 2% to 10%.

i) KRITILEN[®] IM PL836 AND IM PL837

IM PL836 and IM PL837 are impact modifier masterbatches based on a PLA carrier. They increase the impact strength of PLA extruded, calendared, blow moulded and thermoformed articles. IM PL836 is recommended for highly transparent end products, while IM PL837 is proposed for opaque applications or applications that do not require high transparency. Their addition rates vary from 2% - 10%.

j) KRITILEN® NC PL830

NC PL830 is a nucleating agent masterbatch containing inorganic nucleators. It has a PLA carrier and is a cost efficient solution for providing crystallinity to PLA end products.

k) KRITILEN® NC PL831

NC PL831 is a nucleating masterbatch containing a novel active ingredient based on a PLA carrier. This product provides higher crystallinity and shorter cycle times during the injection moulding of PLA resin at lower loading amounts, when compared with typical nucleators.

Color masterbatches:

KRITILEN® COLOR MASTERBATCHES

Plastika Kritis has developed a range of PLA based masterbatches in various shades (yellow, orange, red, blue, green and brown). These masterbatches are brilliant and strong colors and compose the basic portfolio for coloration of compostable films. The colorants used in these masterbatch recipes are approved for food contact applications according to BfR IX Recommendations, also meeting the purity criteria of Resolution AP (89). These products are presented in the table below:

KRITILEN®	Heat resistance (°C)	Light fastness	Compliance to EN13432
Yellow PL11223	240	6	Yes
Yellow PL11224	200	6	Yes
Yellow PL11225	200	6	Yes
Orange PL21790	200	6	Yes
Red PL31619	250	7	Yes
Red PL31620	250	4	Yes
Red PL31621	240	6	Yes
Red PL31622	240	6	Yes (up to 8%)
Violet PL35707	240	6	Yes (up to 8%)
Violet PL35708	240	6	Yes
Blue PL41006	280	8	Yes (up to 4%)
Blue PL41007	280	8	Yes
Green PL51787	240	6	Yes (up to 4%)
Green PL51788	240	6	Yes (up to 4%)
Green PL51789	200	6	Yes (up to 4%)

Heat resistance according to DIN EN 12877

Light fastness according to ISO 105 – B02

DRYING

In-line drying is recommended for KRITILEN® PLA masterbatches. A moisture content of less than 0.025% (250ppm) is recommended to prevent viscosity degradation. KRITILEN® PLA masterbatches are supplied in foiled-lined with moisture content less than 500ppm, when packed. The masterbatch should not be exposed to atmospheric conditions after drying. Package should be kept sealed until ready to use and promptly dry and reseal any unused material.

COMPOSTABILITY

Composting is a method of waste disposal that allows organic materials to be recycled into a product that can be used as a valuable soil amendment. PLA is made primarily of polylactic acid, a repeating chain of lactic acid, which undergoes a 2-step degradation process. First, the moisture and heat in the compost pile attack the PLA polymer chains and split them apart, creating smaller polymers, and finally, lactic acid. Microorganisms in compost and soil, consume the smaller polymer fragments and lactic acid as nutrients. Since lactic acid is widely found in nature, a large number of organisms can metabolize it. At a minimum, fungi and bacteria are involved in PLA degradation. The end result of the process is carbon dioxide, water and also humus, a soil nutrient. This degradation process is temperature and humidity dependent.

Regulatory guidelines and standards for composting revolve around four basic criteria: Material Characteristics, Biodegradation, Disintegration, and Ecotoxicity. Description of the requirements of these testing can be found in the appropriate geographical area: DIN V 54900-1 (Germany), EN 13432 (EU), ASTM D 6400 (USA), GreenPla (Japan). The PLA carrier used in above mentioned KRITILEN® masterbatches, according to its supplier, meets the requirements of these four standards with limitation of maximum layer thickness of 1650 µm and for coating layers up to 37 µm thick.

FOOD APPROVAL STATUS

All above masterbatches contain raw materials, which, according to their suppliers, are approved for contact with food.