

## Dispersion

### ■ What is dispersion?

Dispersion is a measure, at both the microscopic and macroscopic levels, of how a pigment, filler or additive is completely distributed throughout a polymer matrix. It is probably one of the most fundamentally important properties of any masterbatch.

### ■ Why is dispersion important?

Various problems can arise at the conversion stage if good pigment dispersion in the masterbatch is not achieved by the masterbatch producer. These difficulties include:

- processing problems, such as rapid screen plugging and bubble rupture in film extrusion which will result in lower output and/or higher scrap levels;
- agricultural mulch film will be damaged by reduced protection against sunlight;
- lower impact strength.

## Dilution

### ■ What is dilution?

Dilution is a measure of how well and how easily a masterbatch mixes with a fabricator's polymer. Thus a masterbatch exhibiting good dilution properties will produce processed articles (film, bags, pipe, sheet, etc.) showing excellent distribution of the masterbatch within the fabricator's diluting polymer. Conversely, a poorly diluted masterbatch will produce processed articles showing surface defects (lumps, voids), inconsistent colour and/or opacity, streaking and inferior physical performance.

## Melt Flow Index (MFI)

One of the properties most often quoted for both natural polymers and masterbatches is the MELT FLOW INDEX (MFI). The same measurement is also referred to as Melt Flow Rate (MFR) or Melt Flow Number (MFN).

### ■ What is MFI and why is it significant?

Melt Flow Index is the output rate (flow) in grammes that occurs in 10 minutes through a standard die of  $2.0955 \pm 0.0051$  mm diameter and  $8.000 \pm 0.025$  mm in length when a fixed pressure is applied to the melt via a piston and a load of total mass of 2.16 kg at a temperature of 190°C (ASTM D1238 and ISO1133). Some polymers are measured at a higher temperature, some use different weights and some even different orifice sizes. A higher weight is almost invariably required for black masterbatches.

Melt Flow Index is an assessment of average molecular mass and is an inverse measure of the melt viscosity; in other words, the higher a MFI, the more polymer flows under test conditions.

For further information on these topics, please ask your local Cabot representative for our brochures "Dispersion and Dilution" and "Melt Flow Index".

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## MASTERBATCHES



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## Masterbatches for Film Applications



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# Masterbatches for Film Applications

Grade	%	Masterbatch percentage for: Opacity (Black) Contrast Ratio(White)	Typical Addition Level (%)	Typical MFI (g/10 min)	MFI Conditions	Description	Compatibility			
							LDPE	LLDPE	HDPE	PE Copolymer
<b>FOOD PACKAGING</b>										
Black	PE1371	40	4	24	190°C/21.6 kg	Weathering masterbatch with wide European food contact approval Masterbatch complying with the purity requirements prescribed by the FDA 21 CFR 178.3297	Y	Y	Y	Y
	PE2813	25	6.9	11	190°C/10.0 kg		Y	Y	Y	Y
White	PE7002	75	1.9	14	190°C/2.16 kg	Highly concentrated masterbatch for outstanding pigmentation High pigmentation masterbatch ensuring high gloss and good printability	Y	Y	Y	Y
	PE7024	60	2.4	16	190°C/2.16 kg		Y	Y	Y	Y
Additive	PE9007	50	n.a.	1.5	190°C/2.16 kg	Highly concentrated antiblock masterbatch Slip and antiblock masterbatch-slow migration	Y	Y	Y	Y
	PE9172	15	n.a.	9	190°C/2.16 kg		Y	Y	Y	Y
PE9174	15	n.a.	1 to 3	9	190°C/2.16 kg	Slip and antiblock masterbatch-fast migration	Y	Y	Y	Y

## GENERAL PURPOSE FILM

Black	PE1851	50	5	18	190°C/21.6 kg	Standard masterbatch for specified carbon black content Economy masterbatch for specified carbon black content High gloss masterbatch for specified carbon black content Weathering masterbatch with high opacity and gloss Standard masterbatch	Y	Y	Y	Y	
	PE1873	40	6	35	190°C/21.6 kg		Y	Y	Y	Y	
	PE2272	50	5	13	190°C/10.0 kg		Y	Y	Y	Y	
	PE2727	40	3.6	42	190°C/21.6 kg		Y	Y	Y	Y	
	PE2824	n.a.	5.7	43	190°C/21.6 kg		Y	Y	Y	Y	
White	PE7024	60	2.4	16	190°C/2.16 kg	High pigmentation masterbatch ensuring high gloss and good printability Premium masterbatch for outstanding pigmentation Utility cost effective masterbatch Standard masterbatch for LLDPE and HDPE film High pigmentation masterbatch for LLDPE and HDPE film	Y	Y	Y	Y	
	PE7250	70	2.0	45	190°C/2.16 kg		Y	Y	Y	Y	
	PE7428	60	2.4	28	190°C/2.16 kg		Y	Y	Y	Y	
	LL7038	50	2.9	3.5	190°C/2.16 kg		Y	Y	Y	Y	
	LL7049	60	2.4	3.5	190°C/2.16 kg		Y	Y	Y	Y	
Additive	LL8809	5	n.a.	0.5 to 1	190°C/2.16 kg	Highly concentrated process aid masterbatch Process aid masterbatch Antistatic masterbatch - long duration with antiblock Slip masterbatch - slow migration and high temperature resistance Slip masterbatch - fast migration Slip and anti-block masterbatch-slow migration Slip and anti-block masterbatch-fast migration Highly concentrated general purpose UV stabiliser masterbatch General purpose UV stabiliser masterbatch Antiblock masterbatch	Y	Y	Y	Y	
	LL8964	2	n.a.	1 to 2	190°C/2.16 kg		Y	Y	Y	Y	
	PE8811	10	n.a.	0.5 to 2	190°C/2.16 kg		Y	Y	Y	Y	
	PE9020	8	n.a.	0.5 to 2	190°C/2.16 kg		Y	Y	Y	Y	
	PE9041	8	n.a.	0.5 to 2	190°C/2.16 kg		Y	Y	Y	Y	
	PE9172	15	n.a.	1 to 3	190°C/2.16 kg		Y	Y	Y	Y	
	PE9174	15	n.a.	1 to 3	190°C/2.16 kg		Y	Y	Y	Y	
	PE9365	20	n.a.	*	5		190°C/2.16 kg	Y	Y	Y	Y
	PE9373	10	n.a.	*	25		190°C/2.16 kg	Y	Y	Y	Y
	PE9896	20	n.a.	1 to 3	5		190°C/2.16 kg	Y	Y	Y	Y

## AGRICULTURAL FILM

Black	LL4897	40	3.7	56	190°C/21.6 kg	<b>Silage Stretchwrap</b> Standard masterbatch Premium weathering masterbatch Premium masterbatch with highest dispersion quality Fully formulated White + UV stabiliser combi- batch	Y	Y	Y	Y	
	PE2642	40	3.6	19	190°C/21.6 kg		Y	Y	Y	Y	
	PE4441	38	4	13	190°C/10.0 kg		Y	Y	Y	Y	
	PE7344	60	2.7	1.5	190°C/2.16 kg		Y	Y	Y	Y	
Black	PE1851	50	5	18	190°C/21.6 kg	<b>Silage Sheet/Bag</b> Standard masterbatch for specified carbon black content Cost effective masterbatch for specified carbon black content Premium masterbatch for coextrusion applications Standard masterbatch	Y	Y	Y	Y	
	PE2605	50	5	8	190°C/21.6 kg		Y	Y	Y	Y	
	PE2640	40	4	26	190°C/21.6 kg		Y	Y	Y	Y	
	PE2662	n.a.	5	18	190°C/21.6 kg		Y	Y	Y	Y	
White	LL7014	70	2.3	2	190°C/2.16 kg	Outdoor weathering masterbatch	Y	Y	Y	Y	
Black	PE1851	50	5	18	190°C/21.6 kg	<b>Mulch</b> Cost effective masterbatch for specified carbon black content Standard masterbatch for specified carbon black content Premium masterbatch for coextrusion applications Premium masterbatch with superior opacity and weathering performance Standard masterbatch	Y	Y	Y	Y	
	PE2272	50	5	13	190°C/10.0 kg		Y	Y	Y	Y	
	PE2640	40	4	26	190°C/21.6 kg		Y	Y	Y	Y	
	PE2642	40	3.6	19	190°C/21.6 kg		Y	Y	Y	Y	
PE2662	n.a.	5	4 to 20	18	190°C/21.6 kg	Standard masterbatch	Y	Y	Y	Y	
Additive	PE9365	20	n.a.	*	5	190°C/2.16 kg	UV Stabiliser masterbatch for use in white film	Y	Y	Y	Y
PE9373	10	n.a.	*	25	190°C/2.16 kg	UV Stabiliser masterbatch for use in black film	Y	Y	Y	Y	
Additive	PE9135	20	n.a.	*	9	190°C/2.16 kg	<b>Greenhouse/Tunnel</b> General purpose UV stabiliser masterbatch for >100 micron film	Y	Y	Y	Y
PE9136	20	n.a.	*	2	190°C/2.16 kg	UV stabiliser masterbatch containing Nickel quencher	Y	Y	Y	Y	

## INDUSTRIAL FILM

Black	PE2648	n.a.	7.5	11	190°C/10.0 kg	Standard pigmentary masterbatch Masterbatch for specified carbon black content	Y	Y	Y	Y	
	PE1873	40	6	35	190°C/21.6 kg		Y	Y	Y	Y	
White	LL7014	70	2.3	2	190°C/2.16 kg	Outdoor weathering masterbatch	Y	Y	Y	Y	
	PE7000	50	2.9	15	190°C/2.16 kg	Standard masterbatch	Y	Y	Y	Y	
PE7427	40	3.6	4 to 6	18	190°C/2.16 kg	Utility cost effective masterbatch	Y	Y	Y	Y	
Additive	LL8964	2	n.a.	3	190°C/2.16 kg	Standard process aid masterbatch	Y	Y	Y	Y	
	PE8989	80	n.a.	9	190°C/2.16 kg	Extender masterbatch	Y	Y	Y	Y	
	PE9007	50	n.a.	1 to 2	1.5	190°C/2.16 kg	Antiblock masterbatch	Y	Y	Y	Y
	PE9135	20	n.a.	*	9	190°C/2.16 kg	UV stabiliser masterbatch for > 100 micron film	Y	Y	Y	Y
	PE9365	20	n.a.	*	5	190°C/2.16 kg	UV stabiliser masterbatch for thin film	Y	Y	Y	Y

## GARBAGE BAGS

Black	PE2648	n.a.	7.5	11	190°C/10.0 kg	Standard masterbatch Higher opacity masterbatch Economy masterbatch	Y	Y	Y	Y
	PE2824	n.a.	5.7	43	190°C/21.6 kg		Y	Y	Y	Y
	PE4462	n.a.	8.7	15	190°C/10.0 kg		Y	Y	Y	Y
White	LL7015	50	2.9	9	190°C/2.16 kg	Standard masterbatch showing good compatibility with HDPE Easy processing masterbatch Utility cost effective masterbatch	Y	Y	Y	Y
	PE7005	45	3.2	19	190°C/2.16 kg		Y	Y	Y	Y
	PE7427	40	3.6	18	190°C/2.16 kg		Y	Y	Y	Y
Additive	PE8999	40	n.a.	1 to 3	16	190°C/2.16 kg	Desiccant masterbatch	Y	Y	Y
Grey	PG4166	n.a.	n.a.	18	190°C/2.16 kg	Premium masterbatch with good opacifying performance	Y	Y	Y	Y

## CARRIER BAGS

Black	PE2824	n.a.	5.7	43	190°C/21.6 kg	Standard masterbatch High gloss masterbatch	Y	Y	Y	Y
	PE2272	50	5	13	190°C/10.0 kg		Y	Y	Y	Y
White	PE7000	50	2.9	15	190°C/2.16 kg	Standard masterbatch Easy processing masterbatch Standard masterbatch showing good compatibility with HDPE Premium pigmentation and high gloss masterbatch High pigmentation utility masterbatch Utility cost effective masterbatch	Y	Y	Y	Y
	PE7005	45	3.2	19	190°C/2.16 kg		Y	Y	Y	Y
	LL7015	50	2.9	9	190°C/2.16 kg		Y	Y	Y	Y
	PE7002	75	1.9	14	190°C/2.16 kg		Y	Y	Y	Y
	PE7428	60	2.4	28	190°C/2.16 kg		Y	Y	Y	Y
PE7427	40	3.6	3 to 6	18	190°C/2.16 kg	Utility cost effective masterbatch	Y	Y	Y	Y

## HYGIENE FILM

White	PE7024	60	2.4	16	190°C/2.16 kg	Standard masterbatch	Y	Y	Y	Y
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\* As advised by your local Cabot representative.

**Black Opacity:** Indicative masterbatch addition rate required for a 70 micron film to allow a light transmission of maximum 1 Lux from a 100,000 Lux incident light source (measurement method derived from the European Standard Draft CEN/TC249 or the French Standard NFT 54-190 related to agricultural films).

**White Contrast Ratio:** Indicative masterbatch addition rate required for a 50 micron film to allow a contrast ratio of 50%.

**What is Contrast Ratio?** It is a measurement of the Covering Power of a white masterbatch. Visible light reflectance over black background x 100 = Contrast Ratio  
Visible light reflectance over white background

**Addition level:** Indicative percentage commonly used in the industry but largely depending on the application and the film thickness.

The table above presents Cabot's main masterbatch grades.

Cabot also has a wide range of other grades designed to meet the requirements of many different film applications.

In addition, Cabot is always willing to carry out joint development programmes with its customers in order to tailor products to their own applications and needs.