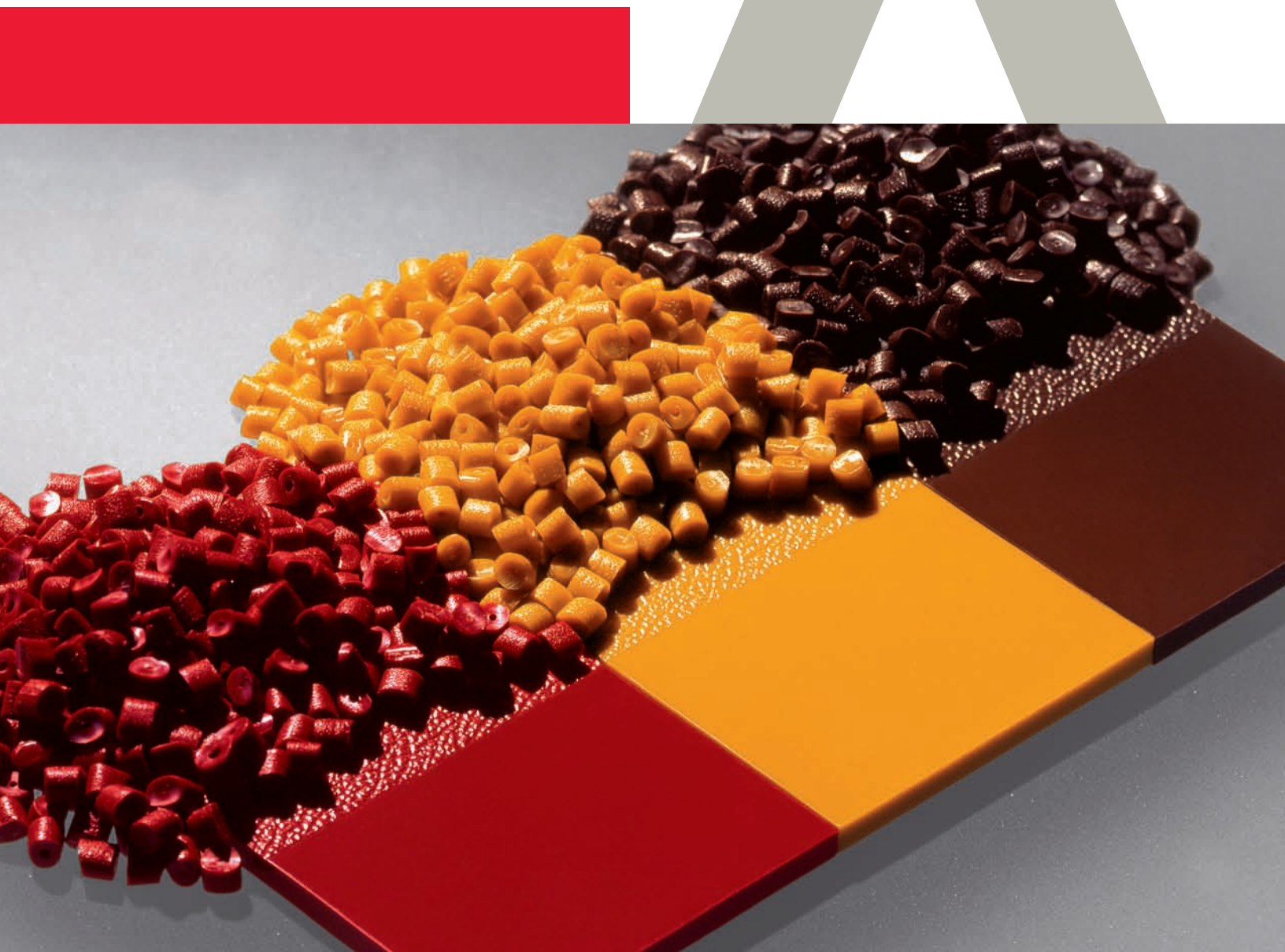


COLORTHERM® Pigments for Plastics Shade Card





COLORING

PLASTICS

Inorganic Pigments for Plastics.

The pigments used for coloring plastics must satisfy a number of very precise technical requirements. Given the usually short dwell times and relatively low shear forces in the processing equipment, the pigments must have good dispersibility, i.e. they must be easy to break down and distribute throughout the plastic concentrate to reach their final tinting strength quickly, but they should not migrate. They must also have high thermal stability, lightfastness and weather stability, suitable for the intended application.

Inorganic pigments in general and the LANXESS range of COLORTHERM® inorganic color pigments in particular satisfy these requirements. This is why these pigments play a significant role in the coloring of plastics. This color shade card represents a selection of the inorganic pigments available from LANXESS that are recommended for the coloring of plastics. Technical data on these products are provided.

Responsible Care and ISO Certification

Integrated into a long tradition of responsible chemical production, LANXESS is fully committed to the Responsible Care® initiative, and in Germany and the USA operates a certified environmental, health, safety, and security management system in line with ISO® 14001. This means that the inorganic pigments from LANXESS are produced with maximum regard for the conservation of the environment and optimum use of resources.

The manufacturing site for COLORTHERM® pigments has ISO 9001-2000 certification, which means that each step in the process has been detailed to help assure our customers the best quality pigment possible. LANXESS is extremely proud that our meticulous detail in manufacturing COLORTHERM® pigments has been recognized with ISO certification.



COLORTHERM® Iron Oxides Pigments

In terms of volume, iron oxide pigments are the most widely used inorganic color pigments. The color range includes yellows, reds, browns, and blacks. Chemically speaking, iron oxide yellows are iron (III) oxide hydrates with acicular particles. Iron oxide reds are iron (III) oxides, iron blacks are iron (II, III) oxides, both with a spherical particle shape. The normal iron oxide browns are mixtures of iron oxide red, iron oxide black, and iron oxide yellow pigments.

Special heat-stable brown and black pigments are also available. These are $(\text{FeMn})_2\text{O}_3$ mixed phase pigments, and include COLORTHERM® Brown 645T and Black 303T pigments. COLORTHERM® pigments are easily dispersed in plastics and some are available in a micronized version with reduced agglomerates.

Whereas regular iron oxide yellow pigments have limited heat stability, the COLORTHERM® pigments are stable to temperatures ranging from 260-300°C. It should be noted that careful tests should be done when coloring PVC where good heat stabilization is required, and with PP and ABS where processing temperature demands are high.

Using an inorganic aftertreatment, COLORTHERM® Yellow 10 and COLORTHERM® Yellow 20, the latter with hydrophobic properties, are heat-resistant up to 260° C. Therefore, both products are suitable for PE-HD and PS.

COLORTHERM® Yellow 30, a stabilized iron/zinc oxide pigment, is heat stable up to 300° C. It can be used in all engineering plastics, including ABS and PA.



COLORTHERM® Chrome Oxide Green Pigments

With their excellent resistance properties – heat-stability, migration resistance, lightfastness, and weather stability – chrome oxide green pigments are suitable for coloring almost any type of plastic. When dispersing these pigments, their relatively high inherent hardness should be kept in mind. This is particularly significant if high-speed mixers are used, e.g. when mixing PVC powders or working with a high-speed extruder, because the pigment particles may abrade the metal.

Chrome oxide green pigments can be mixed with brilliant yellow pigments that have good stability to produce the saturated greens required by the packaging, household appliance industry, etc. Generally speaking, chrome oxide green pigments are used more in the technical sector, e.g. for coloring engineering plastics for machine components.

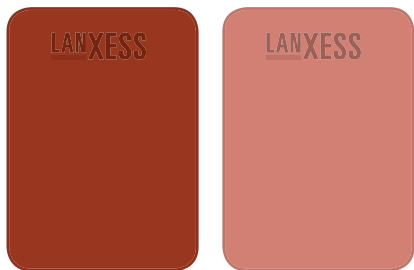
COLORTHERM® Green GN-M is especially recommended for PVC coating pastes, e.g. for truck tarpaulins or floor coverings, because these pastes can be ground in a dissolver.

COLORTHERM® Pigments for Plastics

Masstone 2.0% Pigment **Tint** 0.4% Pigment + 2.0% TiO₂



Masstone Tint
COLORTHERM Red 110M
P.R. 101



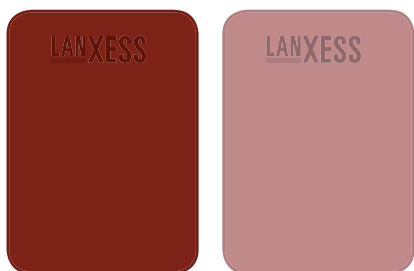
Masstone Tint
COLORTHERM Red 120M
P.R. 101



Masstone Tint
COLORTHERM Red 130M
P.R. 101



Masstone Tint
COLORTHERM Red 140M
P.R. 101



Masstone Tint
COLORTHERM Red 160M
P.R. 101



Masstone Tint
COLORTHERM Red 180M
P.R. 101



Masstone Tint
COLORTHERM Black 303T
P.BI. 33



Masstone Tint
COLORTHERM Black 318
P.BI. 11



Masstone Tint
COLORTHERM Brown 645T
P.Br. 43

COLORTHERM® Pigments for Plastics

Masstone 2.0% Pigment **Tint** 0.4% Pigment + 2.0% TiO₂



Masstone Tint
COLORTHERM Yellow 20
P.Y. 42



Masstone Tint
COLORTHERM Yellow 3950
P.Y. 119



Masstone Tint
COLORTHERM Yellow 26
P.Y. 119



Masstone Tint
COLORTHERM Yellow 30
P.Y. 119



Masstone Tint
COLORTHERM Green GN-M
P.Gr. 17



Masstone Tint
Chrome Oxide Green GX
P.Gr. 17

The colors shown are printed versions of actual plastic chips pigmented with COLORTHERM® pigments. Though every attempt has been made for the colors to be exact matches, there may be slight variations. Therefore, always test our pigments prior to approval.

POLYMER SUITABILITY (Inorganic pigments)**

COLORTHERM® and CHROME OXIDE PRODUCTS	COLOR INDEX NAME/NUMBER	f-PVC	r-PVC	PE-HD	PE-LD	PP	PS	PS-HI	ABS	PMMA	CAB	PA	PC	PU
Red 110M	PR101/77491	+	*	+	+	+	+	+	+	+	+	+	+	+
Red 120M	PR101/77491	+	*	+	+	+	+	+	+	+	+	+	+	+
Red 130M	PR101/77491	+	*	+	+	+	+	+	+	+	+	+	+	+
Red 140M	PR101/77491	+	*	+	+	+	+	+	+	+	+	+	+	+
Red 160M	PR101/77491	+	*	+	+	+	+	+	+	+	+	+	+	+
Red 180M	PR101/77491	+	*	+	+	+	+	+	+	+	+	+	+	+
Black 303T	PBI 33/77537	+	*	+	+	+	+	+	-	+	+	+	+	+
Black 318	PBI 11/77499	+	*	+	+	+	*	*	*	*	*	*	*	*
Brown 645T	PBr 43/77536	+	*	+	+	+	+	+	-	+	+	+	+	+
Yellow 20	PY 42/77492	+	*	+	+	+	+	+	+	+	+	*	*	+
Yellow 3950	PY 119/77496	+	*	+	+	+	+	*	*	*	*	*	*	*
Yellow 26	PY 119/77496	+	*	+	+	+	+	+	+	+	+	+	+	+
Yellow 30	PY 119/77496	+	*	+	+	+	+	+	+	+	+	+	+	+
Green GN-M	PGr 17/77288	+	+	+	+	+	+	+	+	+	+	+	+	+
Chrome Oxide Green GX	PGr 17/77288	+	+	+	+	+	+	+	+	+	+	+	+	+

+ = Suitable - = Not suitable * = Limited use and/or testing in progress

PHYSICAL PROPERTIES (Inorganic pigments)**

COLORTHERM® and CHROME OXIDE PRODUCTS	CHEMICAL DESCRIPTION	PHYSICAL FORM	Fe2o3 content [%] DIN 55 913	PARTICLE SHAPE	max. PARTICLE SIZE (µm)	OIL ABSORPTION (g/100g pigment)	Heat stability [°C] DIN EN 12 877 part 2 approx.	Heat stability [°F] DIN EN 12 877 part 2 approx.	DENSITY (g/cm3)	Sieve residue 45 m [%] DIN 53 195	Loss on ignition 1000 C, 1/2h [%] DIN 55 913	pH value DIN ISO 787-9
Red 110M	Fe ₂ O ₃	Micronized Red powder	94 - 97	Spherical	0.09	28	>300	>572	5.0	max. 0.002	max. 0.7	5.0 - 8.0
Red 120M	Fe ₂ O ₃	Micronized Red powder	94 - 97	Spherical	0.12	28	>300	>572	5.0	max. 0.002	max. 0.6	5.0 - 8.0
Red 130M	Fe ₂ O ₃	Micronized Red powder	94 - 97	Spherical	0.17	26	>300	>572	5.0	max. 0.002	max. 0.6	5.0 - 8.0
Red 140M	Fe ₂ O ₃	Micronized Red powder	94 - 97	Spherical	0.30	24	>300	>572	5.0	max. 0.002	max. 0.5	5.0 - 8.0
Red 160M	Fe ₂ O ₃	Micronized Red powder	94 - 97	Spherical	0.40	22	>300	>572	5.1	max. 0.002	max. 0.5	5.0 - 8.0
Red 180M	Fe ₂ O ₃	Micronized Red powder	94 - 97	Spherical	0.70	18	>300	>572	5.1	max. 0.002	max. 0.3	5.0 - 8.0
Black 303T	(Mn,Fe) ₂ O ₃	Micronized Black powder	58 - 75	Spherical	0.60	15	>320	>608	4.8	max. 0.005	max. 2.0	7.0 - 10.0
Black 318	Fe ₃ O ₄	Black powder	89 - 93	Spherical	0.20	21	>300	>572	4.6	max. 0.005	max. 1.0	7.0 - 10.0
Brown 645T	(Mn,Fe) ₂ O ₃	Brown powder	80 - 88	Spherical	0.30	28	>300	>572	4.7	max. 0.1	max. 1.5	5.5 - 8.5
Yellow 20	FeOOH + Al ₂ O ₃	Micronized Yellow powder	64 - 69	Acicular	0.10 x 0.70	45	260	500	3.8	max. 0.003	max. 16	hydrophob
Yellow 3950	ZnFe ₂ O ₄	Micronized Yellow powder	65 - 68	Elongated	0.15 x 0.50	16	220	428	5.2	max. 0.005	max. 0.5	6.0 - 10.0
Yellow 26	ZnFe ₂ O ₄	Micronized Yellow powder	63 - 70	Acicular	0.15 x 0.50	16	300	572	5.2	max. 0.005	max. 0.5	6.0 - 10.0
Yellow 30	ZnFe ₂ O ₄	Yellow powder	65 - 68	Elongated	0.15 x 0.50	14	300	572	5.2	max. 0.005	max. 0.5	6.0 - 10.0
Green GN-M	Cr ₂ O ₃	Micronized Green powder	98.5 - 99.5	Spherical	0.30	11	>300	>572	5.2	max. 0.005	max. 0.4	5.0 - 7.0
Chrome Oxide Green GX	Cr ₂ O ₃	Green powder	98.5 - 99.5	Spherical	0.35	11	>300	>572	5.2	max. 0.1	max. 0.4	5.0 - 7.0

* = Testing in progress
 Oil absorption: Method QTM-228
 Density: Method ASTM D 281-84
 pH: Method ASTM D 1208-84
 Particle shape by electron micrograph
 Particle size by electron micrograph

** These items are provided as general information only. They are approximate values and are not considered part of the product specifications.

REGULATORY INFORMATION** (Inorganic Pigments)

FDA Compliant Inorganic Pigments for Food Contact Applications

COLORTHERM® and CHROME OXIDE PRODUCTS	FDA STATUS FOOD CONTACT
Red 110M	1
Red 120M	1
Red 130M	1
Red 140M	1
Red 160M	1
Red 180M	1
Black 318	1
Black 303T	2
Yellow 20	not applicable
Yellow 3950	2
Yellow 26	2
Yellow 30	2
Brown 645T	2
Green GN-M	4
Chrome Oxide Green GX	4

FDA STATUS:

NOTE: THE FDA INFORMATION IS PROVIDED AS A GUIDELINE AND IS BELIEVED TO BE ACCURATE AT THE TIME OF PUBLICATION

FDA STATUS #1

21 CFR 178.3297 colorants for polymers subject to the following limitations:

- The iron oxide is of a purity suitable for the intended use.
- The amount of iron oxide used is not in excess of what is reasonably required to accomplish the intended coloring effect.
- The polymer containing the iron oxide complies with all acceptable FDA regulations.
- The finished food-contact article complies with all applicable FDA regulations.

FDA STATUS #2

In compliance with applicable FDA regulations for use at 2% or less, in all types of food contact polymers subject to these limitations and any other applicable limitations.

FDA STATUS #3

In compliance with applicable FDA regulations for use in all types of food contact polymers subject to these limitations and any other applicable limitations:

- The polymer containing the iron oxide complies with all acceptable FDA regulations.
- The finished food-contact article complies with all applicable FDA regulations.

FDA STATUS #4

Based on 178.3297 (Colorants for polymers), may be used as a colorant for olefin polymers that comply with 177.1520; 10% or less may be used as a colorant in rubber articles that comply with 177.2600 and 5% or less may be used in all other polymers except those listed above subject to the limitations of these regulations and any other applicable regulations.

CONEG and RoHS Compliance:

We can certify that these products are compliant with:

- EU Directive 2002/95/EC Directive on the Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment, which restricts the use of:
 - Lead
 - Mercury
 - Cadmium
 - Hexavalent chromium (Cr6+)
 - Polybrominated biphenyls (PBB)
 - Polybrominated diphenyl ether (PBDE)

Any impurity of the above listed chemicals must be less than 0.1% (1000 ppm, or 100 ppm for Cadmium)

- CONEG (Coalition of Northeastern Governors) on Model Toxics in Packaging legislation bans the following as an intentionally added chemicals:

- Lead
- Mercury
- Cadmium
- Hexavalent chromium (Cr6+)

Any impurity of the above listed chemicals must be less than 100 ppm.

If you have any questions on the regulatory status of these products, contact your LANXESS Corporation representative or Regulatory Affairs Manager at LANXESS.

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ISO® is a registered trademark of the International Organization for Standardization.

Responsible Care® is a registered trademark of the American Chemistry Council.

The manner in which you use and the purpose to which you put and utilize our products, technical assistance and information (whether verbal, written or by way of production evaluations), including any suggested formulations and recommendations are beyond our control. Therefore, it is imperative that you test our products, technical assistance and information to determine to your own satisfaction whether they are suitable for your intended uses and applications. This application-specific analysis must at least include testing to determine suitability from a technical as well as health, safety, and environmental standpoint. Such testing has not necessarily been done by us. Unless we otherwise agree in writing, all products are sold strictly pursuant to the terms of our standard conditions of sale. All information and technical assistance is given without warranty or guarantee and is subject to change without notice. It is expressly understood and agreed that you assume and hereby expressly release us from all liability, in tort, contract or otherwise, incurred in connection with the use of our products, technical assistance, and information. Any statement or recommendation not contained herein is unauthorized and shall not bind us. Nothing herein shall be construed as a recommendation to use any product in conflict with patents covering any material or its use. No license is implied or in fact granted under the claims of any patent.

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Note: The information contained in this bulletin is current as of January, 2010. Please contact LANXESS to determine if this publication has been revised.