LANXESS
Energizing Chemistry

Macrolex®
Bayplast®

Colorants for Plastics

MACROLEX® dyes - product range and properties

The MACROLEX® range contains soluble dyes with:

- high heat stability;
- good lightfastness and weather resistance;
- high color strength and;
- outstanding brilliance.

In chemical terms, the dyes belong to various classes. For the coloring of plastics, the heat stability of the colorant is one of the key selection criteria. The data given in the tables on heat stability and lightfastness are guide values and not physical constants. They are dependent on the relevant substrate and the concentration used and must be tested in each individual case.

MACROLEX® dyes are suitable for coloring amorphous thermoplastics, such as:

- PS, SB*, SAN*, ABS and their blends (*not block copolymers);
- PMMA, PC, PPO and their blends;
- PVC-U, PET (PBT);
- (PA-6, PA-12) CA, CAB.

Soluble dyes are not recommended for coloring crystalline systems such as:

- HDPE, LDPE, PP;
- and thermoplastics containing plasticizers, e.g. flexible PVC and flexibilized cellulose esters.

The transparent coloring of glass-clear plastics is only possible with soluble dyes. For opaque coloring, the MACROLEX® dyes have to be combined with opaque inorganic pigments such as:

- titanium dioxide;
- lightfast pigments;
- iron oxide pigments.

MACROLEX® dyes dissolve completely in the plastics melt at the respective processing temperatures of the thermoplastic. In practical application, this means:

- maximum color yield;
- high reproducibility of color formulations; irrespective of the dispersing speed of the equipment used.

The MACROLEX® dyes are soluble in organic solvents, e.g. aromatics, esters, chlorinated hydrocarbons. They are insoluble in water and dilute aqueous solutions of acetic acid or alcohol.

This is important for consumer goods, food packaging and children's toys made of colored plastics, because the dye cannot bleed into the respective media. Migration must be checked in each individual case whenever contact could be made with printing inks and coatings based on organic solvents.

MACROLEX® dyes should be treated like organic pigments when coloring thermoplastics. Thorough mixing and dispersion plus high processing temperatures encourage the dissolving of the dyes. Where dyes with low solubility and high melting point are used, e.g. MACROLEX® Red EG, particular attention should be paid to thorough mixing and dispersion before the plastification stage.

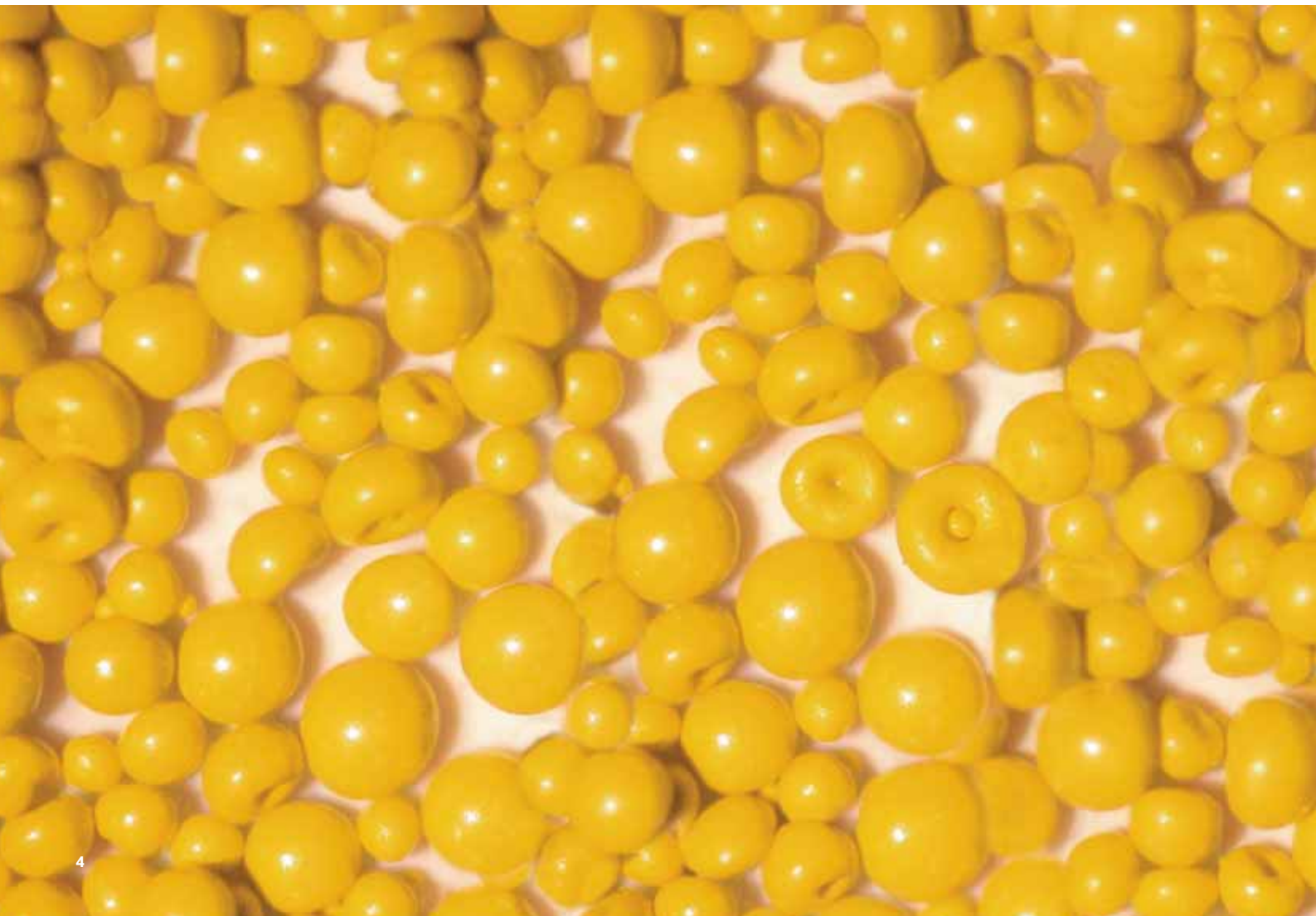
Some dyes, e.g. Solvent Red 111 and Solvent Orange 60, have a tendency to sublimation at high processing temperatures. They can be replaced by other dyes that are faster to sublimation, such as MACROLEX® Red EG, Red E2G and MACROLEX® Orange R.

MACROLEX® dyes comply with the current regulations concerning dyes for use in:

- food packaging;
- food contact applications;
- children's toys made of plastic.

We have revolutionized dyes: MACROLEX® Gran

Microscopic picture of MACROLEX® Yellow G Gran



A new era in coloring plastics has arrived with MACROLEX® Gran, one of the first microgranulated dyes ever:

- efficient
- cost-effective
- easier to process than powder dyes

The outstanding properties of MACROLEX® have been combined in a granular form, making LANXESS one of the few manufacturers in the world to achieve an all-round improvement in the quality of high-grade dyes.

Outstanding properties

Thanks to its unique consistency MACROLEX® Gran saves both time and money. MACROLEX® Gran guarantees maximum color quality and outstanding properties.

Exact metering

MACROLEX® Gran has better flow properties than any powder dye and can therefore be metered more exactly. MACROLEX® Gran is the ideal dye for automatic weighing and continuous manufacturing processes.

Easier to process

MACROLEX® Gran has better solubility and is therefore easier to process. The microgranules are dispersed quickly, evenly and completely.

Safe

The high purity of MACROLEX® Gran dyes provides improved safety in children's toys and packagings for cosmetics and foods.

Virtually no residues

The microfine MACROLEX® Gran particles have very good flow properties that allow containers to be emptied almost completely before disposal. Production units are much easier to clean.

Very low dust formation

MACROLEX® Gran generates much less dust than powder dyes. Handling is therefore much cleaner and more environmentally friendly and has a lower impact on health.

Reduced capacities

On account of its lower volume, MACROLEX® Gran is more economic to store, transport and process.

High quality

Compared with most conventional powder dyes, MACROLEX® Gran dyes are characterized by their consistent high quality.

Product range

MACROLEX® Gran Dyes in Polystyrene + 2.0 % TiO_2 (1/3 Standard Depth)

Dyes	Dyestuff type	Color Index Part I	Color Index Part II	Safety data sheet number
MACROLEX® Yellow 6G Gran	Methine	Solvent Yellow 179; D. Y. 201	–	142011
MACROLEX® Yellow 3G Gran	Pyrazolone	Solvent Yellow 93	48160	141996
MACROLEX® Yellow G Gran	Quinophthalone	Solvent Yellow 114; D. Y. 54	47020	141384
MACROLEX® Yellow E2R Gran	Quinophthalone	–	–	286269
MACROLEX® Yellow RN	Anthraquinone	Pigment Yellow 147	60645	409905
MACROLEX® Orange 3G Gran	Perinone	Solvent Orange 60	564100	143972
MACROLEX® Orange R Gran	Methine	Solvent Orange 107; D. O. 47	–	141678
MACROLEX® Red E2G Gran	Perinone	Solvent Red 179	564150	147269
MACROLEX® Red A	Dyestuff mixture	–	–	56384115
MACROLEX® Red EG Gran	Perinone	Solvent Red 135	564120	141392
MACROLEX® Red G Gran	Anthraquinone	Solvent Red 111	60505	142038
MACROLEX® Red H	Azo	–	–	238914

Shades may differ from the real color due to printing influence.

Dyes	Dyestuff type	Color Index Part I	Color Index Part II	Safety data sheet number
MACROLEX® Red B	Azo	Solvent Red 195	–	164899
MACROLEX® Red 5B Gran	Anthraquinone	Solvent Red 52	68210	142542
MACROLEX® Red Violet R Gran	Anthraquinone	D. V. 31; D. V. 26; S. V. 59	62025	147277
MACROLEX® Violet 3R Gran	Anthraquinone	Solvent Violet 36	–	144189
MACROLEX® Violet B Gran	Anthraquinone	Solvent Violet 13	60725	142127
MACROLEX® Violet 3B Gran	Anthraquinone	Solvent Violet 13	60725	168851
MACROLEX® Blue 3R Gran	Anthraquinone	–	–	148125
MACROLEX® Blue RR Gran	Anthraquinone	Solvent Blue 97	615290	142119
MACROLEX® Blue 2B Gran	Anthraquinone	Solvent Blue 104; S. B. 87	61568	979965
MACROLEX® Green 5B Gran	Anthraquinone	Solvent Green 3	61565	151053
MACROLEX® Green G Gran	Anthraquinone	Solvent Green 28	625580	153153
MACROLEX® Fluorescent Yel. 10GN	Coumarin	Solvent Yellow 160:1	–	114476
MACROLEX® Fluorescent Red G	Coumarin	–	–	145355

Shades may differ from the real color due to printing influence.

Suitability

Dyes	Color Index Part I	PS	SB[1]	ABS	SAN	PMMA	PC	PVC-U	PPO	PET	POM	PA 6/ PA 6.6	PBT	PES Fibres
MACROLEX® Yellow 6G Gran	S. Y. 179; D. Y. 201	+	+	+	+	+	+	+	+	+	o	–	o	o
MACROLEX® Yellow 3G Gran	S. Y. 93	+	+	–	+	+	+	+	+	+	–	–	o	–
MACROLEX® Yellow G Gran	S. Y. 114; D. Y. 54	+	+	+	+	+	+	+	+	+	o	–	o	–
MACROLEX® Yellow E2R Gran	–	+	+	+	+	+	+	+	+	+	o	–	o	+
MACROLEX® Yellow RN	P. Y. 147	–	–	–	–	–	–	–	–	+	–	–	–	+
MACROLEX® Orange 3G Gran	S. O. 60	+	+	+	+	+	+	+	+	+	o	+[2]	o	–
MACROLEX® Orange R Gran	S. O. 107; D. O. 47	+	+	+	+	+	+	+	+	+	o	–	o	–
MACROLEX® Red E2G Gran	S. R. 179	+	+	+	+	+	+	+	+	+	o	+	o	–
MACROLEX® Red A	–	+	+	+	+	+	o	+	–	+	–	–	o	–
MACROLEX® Red EG Gran	S. R. 135	+	+	+	+	+	+	+	+	+	o	+	o	+
MACROLEX® Red G Gran	S. R. 111	+	+	+	+	+	+	+	+	–	o	–	–	–
MACROLEX® Red H	–	+	+	–	+	+	o	+	–	+	–	–	o	–
MACROLEX® Red B	S. R. 195	+	+	+	+	+	o	+	–	o	–	–	o	–
MACROLEX® Red 5B Gran	S. R. 52	+	+	+	+	+	+	+	+	+	o	+	o	–
MACROLEX® Red Violet R Gran	D.V. 31; D.V. 26; S. V. 59	+	+	+	+	–	+	+	+	+	o	–	o	+
MACROLEX® Violet 3R Gran	S. V. 36	+	+	+	+	+	+	+	+	+	o	+	o	–
MACROLEX® Violet B Gran	S. V. 13	+	+	+	+	+	+	+	+	+	o	–	o	–
MACROLEX® Violet 3B Gran	S. V. 13	+	+	+	+	+	+	+	+	+	o	–	o	–
MACROLEX® Blue 3R Gran	–	+	+	+	+	+	+	+	+	+	o	+	o	o
MACROLEX® Blue RR Gran	S. B. 97	+	+	+	+	+	+	+	+	+	o	+	o	o
MACROLEX® Blue 2B Gran	S. B. 104; S. B. 87	+	+	+	+	+	+	+	+	+	o	+	o	o
MACROLEX® Green 5B Gran	S. G. 3	+	+	+	+	+	+	+	+	+	o	+	o	o
MACROLEX® Green G Gran	S. G. 28	+	+	+	+	+	+	+	+	+	o	–	o	+
MACROLEX® Fluorescent Yel. 10GN	S. Y. 160:1	+	+	+	+	+	+	+	+	+	o	o	o	–
MACROLEX® Fluorescent Red G	–	+	+	+	+	+	+	+	–	+	o	–	o	–

[1] not suitable for styrene-butadiene block copolymers
[2] limited usage in PA due to sublimation
+ suitable
o suitable with restrictions
– not recommended

Heat stability of MACROLEX® dyes (°C) in plastics

according to DIN EN 12877-2

Dyes	PS	SB	ABS	SAN	PMMA	PC	PA 6	PA 6.6	PET	PBT
MACROLEX® Yellow 6G Gran	300	300	260	280	300	350	–	–	290	280
MACROLEX® Yellow 3G Gran	300	280	–	260	300	340	–	–	280	280
MACROLEX® Yellow G Gran	300	300	300	300	300	340	–	–	290	280
MACROLEX® Yellow E2R Gran	300	300	300	300	300	340	–	–	290	280
MACROLEX® Yellow RN	–	–	–	–	–	–	–	–	300	–
MACROLEX® Orange 3G Gran	300	300	300	300	300	350	300	300	290	280
MACROLEX® Orange R Gran	300	300	300	300	280	320	–	–	290	280
MACROLEX® Red E2G Gran	300	300	300	300	300	350	300	300	290	280
MACROLEX® Red A	300	280	280	300	280	300	–	–	300	–
MACROLEX® Red EG Gran	300	300	280	300	300	350	260	260	290	280
MACROLEX® Red G Gran	300	300	300	300	300	350	280	280	–	–
MACROLEX® Red H	280	280	–	280	260	–	–	–	290	280
MACROLEX® Red B	280	280	280	280	260	300	–	–	280	–
MACROLEX® Red 5B Gran	280	300	300	300	300	350	300	290	290	280
MACROLEX® Red Violet R Gran	300	300	280	300	–	300	–	–	260	280
MACROLEX® Violet 3R Gran	300	300	280	300	300	350	280	260	290	280
MACROLEX® Violet B Gran	300	300	280	300	300	350	–	–	290	280
MACROLEX® Violet 3B Gran	300	300	280	300	300	350	–	–	290	280
MACROLEX® Blue 3R Gran	300	300	300	300	300	340	280	270	290	280
MACROLEX® Blue RR Gran	300	300	300	300	300	340	300	280	290	280
MACROLEX® Blue 2B Gran	300	300	300	300	300	340	280	–	290	280
MACROLEX® Green 5B Gran	300	300	300	300	300	350	280	260	290	280
MACROLEX® Green G Gran	300	300	300	300	300	350	–	–	290	280
MACROLEX® Fluorescent Yel. 10GN	300	300	260	300	300	350	240	240	280	280
MACROLEX® Fluorescent Red G	300	260	240	300	300	350	–	–	290	280

– not recommended

1/3 standard depth with 1 % TiO_2 (ABS 4 % TiO_2, PS 2 % TiO_2)

Plastics and TiO_2 used for testing:

PS: BASF Polystyrene 143E
SB: BASF Polystyrene 472C
ABS: LANXESS Novodur® P2X
SAN: BASF Luran® 368R
PMMA: Röhm Plexiglas® 7H
PC: Bayer MaterialScience Makrolon® 2800
PA 6: LANXESS Durethan® B30S
PA 6.6: LANXESS Durethan® A30H 1.0
PET: Voridian® 9921 W
PBT: LANXESS Pocan® B1505
TiO_2: Kerr McGee Tronox® R-FK-3

The test results were evaluated with the above mentioned conditions and polymers. For other polymers, polymergrades, TiO_2 grades and dyes concentrations, the heatstability can be different from the values above.

Lightfastness of MACROLEX® dyes

according to DIN EN ISO 4892-2

Dyes	PC			PS			PMMA		
	1/3 SD Reduction 1.0 % TiO_2		Transparent 0.05 % dye	**1/3 SD** Reduction 2.0 % TiO_2		Transparent 0.05 % dye	**1/3 SD** Reduction 1.0 % TiO_2		Transparent 0.05 % dye
	Dye content in %	Blue Wool Scale	Blue Wool Scale	**Dye content in %**	Blue Wool Scale	Blue Wool Scale	**Dye content in %**	Blue Wool Scale	Blue Wool Scale
MACROLEX® Yellow 6G Gran	0.070 %	7	8	0.360%	6-7	8	0.070 %	6-7	8
MACROLEX® Yellow 3G Gran	0.142 %	7	8	0.260%	6-7	8	0.142 %	6-7	8
MACROLEX® Yellow G Gran	0.065 %	7	8	0.120%	6-7	8	0.065 %	7	8
MACROLEX® Yellow E2R Gran	0.070 %	7	8	0.140 %	6-7	8	0.070 %	7	8
MACROLEX® Orange 3G Gran	0.155 %	7	8	0.280 %	6	8	0.155 %	6	8
MACROLEX® Orange R Gran	0.045 %	5	8	0.090 %	4	7	0.045 %	3-4	7
MACROLEX® Red E2G Gran	0.160 %	5	8	0.300 %	4-5	8	0.160 %	4	8
MACROLEX® Red A	0.060 %	5	8	0.110 %	4	7	0.060 %	3-4	7
MACROLEX® Red EG Gran	0.210 %	7	8	0.400 %	6	8	0.210 %	7	8
MACROLEX® Red G Gran	0.245 %	4	7	0.470 %	4	6-7	0.245 %	4	6-7
MACROLEX® Red H	–	–	–	0.110 %	5	7-8	0.055 %	6	7-8
MACROLEX® Red B	–	–	–	0.120 %	6	7-8	0.060 %	6-7	7-8
MACROLEX® Red 5B Gran	0.100 %	4-5	7	0.195 %	3-4	7	0.100 %	4-5	7
MACROLEX® Red Violet R Gran	0.105 %	6-7	7-8	0.200 %	6	7-8	–	–	–
MACROLEX® Violet 3R Gran	0.125 %	6-7	7	0.220 %	6	7	0.125 %	6-7	7
MACROLEX® Violet B Gran	0.090 %	6-7	7-8	0.180 %	5-6	7-8	0.090 %	6-7	7-8
MACROLEX® Violet 3B Gran	0.090 %	6-7	7-8	0.180 %	5-6	7-8	0.090 %	6-7	7-8
MACROLEX® Blue 3R Gran	0.110 %	6	8	0.210 %	6	8	0.110 %	6	8
MACROLEX® Blue RR Gran	0.125 %	6	8	0.230 %	6	8	0.125 %	6	8
MACROLEX® Blue 2B Gran	0.125 %	6	8	0.230 %	6	8	0.125 %	6	8
MACROLEX® Green 5B Gran	0.105 %	6	7-8	0.200 %	5-6	7-8	0.105 %	6	7-8
MACROLEX® Green G Gran	0.150 %	7-8	8	0.300 %	7	8	0.150 %	7	8
MACROLEX® Fluorescent Yel. 10GN	0.100 %	5	6-7	0.200 %	3-4	6	0.100 %	4	6
MACROLEX® Fluorescent Red G	0.100 %	5	7	0.200 %	4	7	0.100 %	3-4	7

– not recommended

Plastics and TiO_2 used for testing:

PC: Bayer MaterialScience Makrolon® 2800
PS: BASF Polystyrene® 143E
PMMA: Röhm Plexiglas® 7H
TiO_2: Kerr McGee Tronox® R-FK-3

The test results were evaluated with the above mentioned conditions and polymers. For other polymers, polymergrades, TiO_2 grades and dyes concentrations, the lightfastness can be different from the values above.
The results were evaluated against the 8-step blue wool scale. Fastness to step 8 indicates very good lightfastness and to step 1 poor lightfastness.

Solubility

according to DIN EN ISO 7579

Dyes	Acetone	Benzyl Alcohol	Butyl Acetate	Ethanol	MMA	Methylene Chloride	Styrene Monomer	Xylene	MEK	Toluene	Paraffin 52/54	Stearic Acid
MACROLEX® Yellow 6G Gran	200.00	8.00	95.00	2.00	146.0	555.00	336.0	133.0	350	250	<1	15
MACROLEX® Yellow 3G Gran	9.80	5.80	7.70	0.55	7.0	180.00	51.0	20.0	21	25	2	12
MACROLEX® Yellow G Gran	0.50	1.80	0.40	0.04	0.8	5.20	1.1	1.4	*	*	*	*
MACROLEX® Yellow E2R Gran	0.0	2.50	0.50	0.10	1.5	10.00	3.5	1.6	*	*	*	*
MACROLEX® Yellow RN	–	–	–	–	–	–	–	–	–	–	–	–
MACROLEX® Orange 3G Gran	1.00	4.80	1.40	0.16	1.0	10.00	6.3	4.4	*	*	*	*
MACROLEX® Orange R Gran	3.00	71.00	2.50	0.86	1.6	64.00	5.4	1.4	*	*	1	5
MACROLEX® Red E2G Gran	0.50	20.00	0.70	<0.10	2.0	7.00	4.5	2.5	2	3	*	*
MACROLEX® Red A	0.40	1.00	0.40	0.10	1.0	45.00	4.0	1.0	*	*	*	*
MACROLEX® Red EG Gran	0.05	0.24	<0.05	<0.05	0.2	0.15	1.2	0.6	*	*	*	*
MACROLEX® Red G Gran	4.00	12.00	4.00	0.06	10.0	49.00	14.0	8.0	9	*	1	15
MACROLEX® Red H	9.20	19.00	9.00	1.00	22.0	200.00	65.0	24.0	20	22	1	20
MACROLEX® Red B	0.20	0.50	0.20	<0.1	0.5	40.00	3.5	0.5	*	*	*	*
MACROLEX® Red 5B Gran	0.30	5.00	0.30	0.20	0.5	30.00	3.0	1.8	*	*	1	10
MACROLEX® Red Violet R Gran	20.00	6.00	20.00	0.70	35.0	40.00	25.0	12.0	1	20	1	20
MACROLEX® Violet 3R Gran	2.00	5.50	3.00	0.20	8.5	20.00	30.0	2.5	4	2	<1	10
MACROLEX® Violet B Gran	1.50	4.00	3.00	0.10	5.5	30.00	12.0	8.0	2	7	<1	20
MACROLEX® Violet 3B Gran	1.00	3.50	3.00	0.10	5.0	25.00	12.0	9.0	*	*	*	*
MACROLEX® Blue 3R Gran	20.00	100.00	60.00	1.50	90.0	250.00	100.0	150.0	*	*	*	*
MACROLEX® Blue RR Gran	3.00	5.00	11.00	0.20	10.	240.00	55.0	120.0	13	125	2	5
MACROLEX® Blue 2B Gran	3.00	4.00	8.00	0.10	1.0	240.00	20.0	19.0	*	*	*	*
MACROLEX® Green 5B Gran	1.00	3.50	3.00	0.10	4.5	20.00	12.0	17.0	2	20	1	10
MACROLEX® Green G Gran	2.00	4.00	4.50	0.10	10.0	55.00	25.0	30.0	*	*	1	10
MACROLEX® Fluorescent Yel. 10GN	2.80	12.00	1.40	0.40	2.1	67.00	4.5	1.5	*	*	*	*
MACROLEX® Fluorescent Red G	0.30	0.50	0.15	0.01	0.4	8.00	1.2	0.4	*	*	<1	1

– = not soluble

* = Data not available

Solvent solubility is measured in g/l at room temperature (23°C/73°F)

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

MACROLEX® dyes – ecological status

MACROLEX® dyes meet the high **purity requirements** in many application areas. These purity requirements are described below in detail.

Packaging: Directive 94/64/EC
The concentration of lead, cadmium, mercury or hexavalent chromium altogether must not exceed 100 ppm by weight (0.01 %).

RoHS: (Restriction of the use of certain hazardous substances in electrical and electronic equipment)
Directive 2002/95/EG for Europe
Similar regulations exist in Japan, USA and China

Toys: EN 71-3 (Safety of toys; Migration of certain elements)
EN 71-9 (Safety of toys; Requirements of Organic chemical compounds)

Food contact: Many national regulations for example:
Europe: Resolution AP (89) 1. The purity requirements are satisfied by all MACROLEX® dyes.
United States: Nearly all MACROLEX® dyes are approved for the coloring of PET in accordance with the FDA regulations, at loadings less than 0.20 %.
Japan: JHOSPA (Japan Hygienic Olefin and Styrene Plastics Association)
The prerequisite for the use of colorants in food contact applications is a maximum of 100 ppm lead, 50 ppm mercury and 100 ppm cadmium.
Australia-Standard 2070.6: Plastic Materials for Food Contact Use; Limiting values for heavy metals, primary aromatic Amines.

LANXESS MACROLEX® dyes fulfill these requirements and many other national regulations. Due to their high purity they offer significant advantages to the end-user.
For more information please contact your local LANXESS representative, visit our website www.lanxess.com or send an e-mail to colorants@lanxess.com.

PET-bottles colored with MACROLEX® dyes

Regulatory information USA/Europe

United States

Most MACROLEX® dyes are approved for coloring PET in accordance with FDA regulations for food contact. Please refer to Table 1 for details. MACROLEX® dyes also satisfy CONEG regulations governing the permissible content of heavy metals in packaging. In addition, MACROLEX® dyes meet conventions governing the content of soluble heavy metals in toys. Please reference Table 2 for more information.

Europe

In Europe, a number of national regulations apply governing the purity of colorants that may be used in plastics for food contact applications. The purity requirements of the Europe Resolution AP (89) 1 are satisfied by all MACROLEX® dyes. This regulation indicates details of the listing status and any restrictions on the use of these dyes. Please contact the LANXESS Deutschland GmbH location for additional information on national food contact regulations.

Regulation 94/62/EC governs the permissible content of heavy metals in packaging. MACROLEX® dyes meet conventions governing the content of soluble heavy metals in toys. Please see Table 2 for more information.

Table 1: FDA Compliant Dyes for Food Contact Applications

Fluor. Yellow 10GN	1	Fluor. Red G	1	Violet 3R Gran	1
Yellow 6G Gran	1	Red EG Gran	1	Violet B Gran	1
Yellow 3G Gran	1	Red E2G Gran	1	Blue 3R Gran	1
Yellow G Gran	1	Red H	1	Blue RR Gran	1
Yellow E2R Gran	1	Red B	4	Blue 2B Gran	1
Orange 3G Gran	1, 2	Red 5B Gran	1	Green 5B Gran	1
Orange R Gran	1, 3	Red Violet R Gran	1	Green G Gran	1

FDA Status: MACROLEX® Dyes

1 This dye meets the FDA requirements for Conditions of Use D, E, F, G in PET resin at loadings less than or equal to 0.20 %.
2 This dye meets the FDA requirements for Conditions of Use F and G in foamed PS resin at loadings less than or equal to 0.025 %.
3 This dye meets the FDA requirements for Conditions of Use F and G in foamed PS resin at loadings less than or equal to 0.30 % with exposure times limited to one hour or less.
4 This dye meets the FDA requirements for Conditions of Use D, E, F, G in PET resin at loadings less than or equal to 0.10 %.

FDA Conditions to Use

D Hot filled or pasteurized below 150°F
E Room temperature filled and stored, no thermal treatment in container
F Refrigerated storage, no thermal treatment in container
G Frozen storage, no thermal treatment in container

Table 2: Total Heavy Metal Content of MACROLEX® Dyes

Metal	Heavy Metal Content (ppm)
Antimony	≤ 25
Arsenic	≤ 1
Barium	≤ 50
Cadmium	≤ 1
Chromium	≤ 20
Lead	≤ 10
Mercury	≤ 1
Selenium	≤ 25
Zinc	≤ 100*

* except for Red H Zn ≤ 2000

Regulatory Compliance Information: Some of the end uses of the products described in this publication must comply with applicable regulations, such as the FDA, NSF, USDA, CPSC and BfR. If you have any questions on the regulatory status of these products, contact your LANXESS representative or Regulatory Affairs Manager at LANXESS.

Regulatory information Japan

Since 1977, Japan has maintained a positive list for colorants which can be used in plastics for food-contact applications. It is issued by the Japan Hygienic Olefin and Styrene Plastics Association (JHOSPA) and is therefore, strictly speaking, not a legal requirement.

A further prerequisite for the use of colorants is that they contain no more than 100 ppm lead, 50 ppm arsenic, 50 ppm mercury and 100 ppm cadmium.The approval status is more complex in the case of organic pigments and dyes. Approval depends on the field of application. The approval status of these products depending on the polymer and field of application is shown in the table below.

JHOSPA: Approval of MACROLEX® dyes depending on the polymer and field of application

Applications:
A = Oil and fat, fatty foods
B = Alcoholic foods
C = Neutral foods (pH > 5)
D = Acid foods (pH < 5)

Dyes	Application	PE	PP	PS	AS	ABS	PMMA	PA	PET	PC	PPE	POM	PBT
MACROLEX® Yellow 6G Gran	A	–	–	–	x	x	x	–	x	x	–	–	–
	B	–	–	x	x	x	–	–	x	x	–	–	–
	C	–	–	x	x	x	x	–	x	x	–	–	–
	D	–	–	x	x	x	x	–	x	x	–	–	–
MACROLEX® Yellow 3G Gran	A	–	–	–	x	–	x	–	x	x	–	–	–
	B	–	–	x	x	–	–	–	–	x	–	–	–
	C	–	–	x	x	x	x	–	–	–	–	–	–
	D	–	–	x	x	x	x	–	x	x	–	–	–
MACROLEX® Yellow G Gran	A	–	–	–	x	–	–	–	x	x	–	–	–
	B	–	–	x	x	–	–	–	–	x	–	–	–
	C	–	–	x	x	x	x	–	x	x	–	–	–
	D	–	–	x	x	x	x	–	–	x	–	–	–
MACROLEX® Orange 3G Gran	A	–	–	–	x	–	x	–	–	x	–	–	–
	B	–	–	x	x	x	–	–	–	x	–	–	–
	C	–	–	x	x	x	x	–	–	–	–	–	–
	D	–	–	x	x	x	x	–	–	x	–	–	–
MACROLEX® Orange R Gran	A	–	–	–	x	x	x	–	–	x	–	–	–
	B	–	–	x	x	x	–	–	–	x	–	–	–
	C	–	–	x	x	x	x	–	–	x	–	–	–
	D	–	–	x	x	x	x	–	–	x	–	–	–
MACROLEX® Red E2G Gran	A	–	–	–	x	–	–	–	x	x	–	–	–
	B	–	–	x	x	x	x	–	x	x	–	–	–
	C	–	–	x	x	x	x	x	x	x	–	–	–
	D	–	–	x	x	x	x	x	x	x	–	–	–
MACROLEX® Red EG Gran	A	–	–	–	x	x	–	–	x	x	–	–	–
	B	–	–	x	x	x	x	–	x	–	–	–	–
	C	–	–	x	x	x	x	–	x	x	–	–	–
	D	–	–	x	x	x	x	–	x	x	–	–	–

Dyes	Application	PE	PP	PS	AS	ABS	PMMA	PA	PET	PC	PPE	POM	PBT
MACROLEX® Red G	A	–	–	–	x	–	x	–	–	x	–	–	–
	B	–	–	x	x	–	–	–	–	x	–	–	–
	C	–	–	x	x	x	x	–	–	x	–	–	–
	D	–	–	x	x	x	x	–	–	x	–	–	–
MACROLEX® Red 5B Gran	A	–	–	–	x	x	x	–	x	x	–	–	–
	B	–	–	x	x	x	–	–	x	x	–	–	–
	C	–	–	x	x	x	x	–	x	x	–	–	–
	D	–	–	x	x	x	x	–	x	x	–	–	–
MACROLEX® Red Violet R Gran	A	–	–	–	x	x	x	–	x	x	–	–	–
	B	–	–	x	x	x	x	–	x	x	–	–	–
	C	–	–	x	x	x	x	–	x	x	–	–	–
	D	–	–	x	x	x	x	–	x	x	–	–	–
MACROLEX® Violet 3R Gran	A	–	–	–	x	–	x	–	x	x	–	–	–
	B	–	–	x	x	x	x	–	x	x	–	–	–
	C	–	–	x	x	x	x	–	x	x	–	–	–
	D	–	–	x	x	x	x	–	x	x	–	–	–
MACROLEX® Violet B Gran	A	–	–	–	x	–	x	–	x	x	–	–	–
	B	–	–	x	x	x	x	–	x	x	–	–	–
	C	–	–	x	x	x	x	–	x	x	–	–	–
	D	–	–	x	x	x	x	–	x	x	–	–	–
MACROLEX® Blue 3R Gran	A	–	–	–	x	–	x	–	x	x	–	–	–
	B	–	–	x	x	x	x	–	x	x	–	–	–
	C	–	–	x	x	x	x	–	x	x	–	–	–
	D	–	–	x	x	x	x	–	x	x	–	–	–
MACROLEX® Blue RR Gran	A	–	–	x	x	x	x	–	x	x	–	–	–
	B	–	–	x	x	x	x	–	x	x	–	–	–
	C	–	–	x	x	x	x	–	x	x	–	–	–
	D	–	–	x	x	x	x	–	x	x	–	–	–
MACROLEX® Green 5B Gran	A	–	–	–	x	x	x	–	x	x	–	–	–
	B	–	–	x	x	x	x	–	x	x	–	–	–
	C	–	–	x	x	x	x	–	x	x	–	–	–
	D	–	–	x	x	x	x	–	x	x	–	–	–
MACROLEX® Green G Gran	A	–	–	–	x	x	x	–	x	x	–	–	–
	B	–	–	x	x	x	x	–	x	x	–	–	–
	C	–	–	x	x	x	x	–	x	x	–	–	–
	D	–	–	x	x	x	x	–	x	x	–	–	–
MACROLEX® Fluorescent Yel. 10GN	A	–	–	–	x	x	x	–	–	–	–	–	–
	B	–	–	x	x	x	x	–	–	–	–	–	–
	C	–	–	x	x	x	x	–	–	–	–	–	–
	D	–	–	x	x	x	x	–	–	–	–	–	–

x approved
– not approved

BAYPLAST® Pigments

In addition to our range of MACROLEX® solvent dyes, LANXESS offers BAYPLAST® organic pigments: BAYPLAST® Yellow G and BAYPLAST® Yellow 5G. These brilliant pigments exhibit excellent heat stability, lightfastness and weatherability and are suitable for the coloration of most engineering thermoplastics including PA 6 and PA 6.6, polyolefins and PVC.

Both pigments are formulated in a unique microgranular form, which offers the following advantages.

- lower dust formation
- easier to process than conventional powders
- excellent handling and flow properties
- more precise metering
- improved dispersion characteristics
- higher bulk density
- less residue remains when package is emptied

Heat stability of BAYPLAST® pigments in Polypropylene (Transparent / 1 % TiO_2 1/3 Standard Depth)

Pigments		HD-PE	PP	PS	ABS	PBT	PET	PA 6	PA 6.6
BAYPLAST® Yellow G Gran	Full shade	300	300	300	280	270	280	260	–
	Reduction with white	300	300	300	280	270	280	260	–
BAYPLAST® Yellow 5G Gran	Full shade	300	300	300	280	270	300	280	270
	Reduction with white	300	300	300	280	270	300	280	270

Lightfastness of BAYPLAST® pigments

Pigments		HD-PE	PP	PS	ABS	PBT	PET	PA 6	PA 6.6
BAYPLAST® Yellow G Gran	Full shade	8	8	8	8	7	8	8	–
	Reduction with white	8	8	8	8	7	8	6-7	–
BAYPLAST® Yellow 5G Gran	Full shade	8	8	8	6-7	8	8	8	8
	Reduction with white	8	8	8	8	8	8	8	8

Shades may differ from the real color due to printing influence.

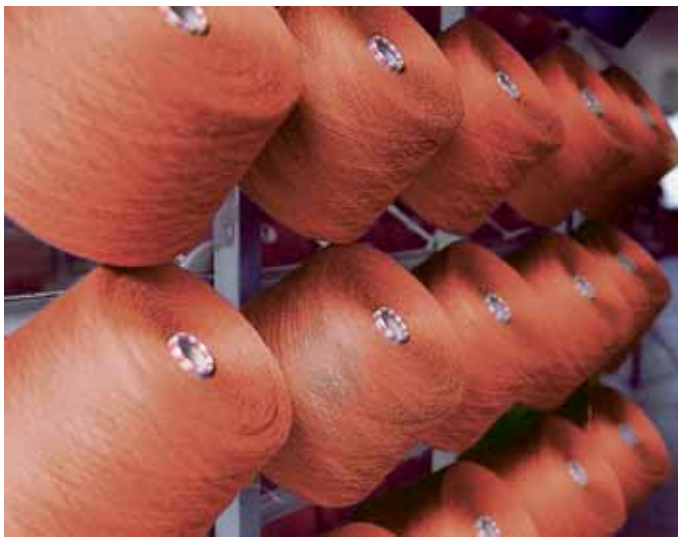
Materials [1] and concentrations [2] used for testing of heat stability and lighfastness:

[1] HD-PE: SABIC Sabic® M8003
ABS: DOW Magnum 3453
PA 6: LANXESS Durethan® B30S
PP: PIO Kunststoffe Stamylan® P
PBT: LANXESS Pocan® B1505
PA 6.6: LANXESS Durethan® A30H 1.0
PS: BASF Polystyrene 143E
PET: VORIDIAN Voridian® 9921 W
TiO_2: Kerr McGee Tronox® R-FK-3

[2] 0.1 % pigment + 1 % TiO_2

– not recommended

The test result were evaluated with the above mentioned conditions and materials. For other polymers, polymergrades, TiO_2 grades and pigment concentrations, the results can be different from the values above.



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