

Makrofol® TP 244

INNOVATION & EXCELLENCE IN **FILMS** **MAKROFOL**
BAYFOL

Bayer MaterialScience introduces a polycarbonate film with an external UV protective layer into the market. Makrofol® TP 244 offers a solution for all applications, where the combination of lightfastness and the typical properties of polycarbonate films are important - as is the case for cell phone housings.



The possible effects of UV radiation range from yellowing through to changes in the material that can affect the mechanical properties. Consequently there is a growing trend toward UV-resistant plastics even for applications that are not constantly exposed to direct sunlight. Now Bayer MaterialScience AG has developed Makrofol® TP 244, a polycarbonate film that is made resistant to UV radiation by an external protective layer.

The requirements for color fastness in many areas are extremely high and customers are therefore increasingly demanding UV-resistant surfaces for cell phone housings, labels, front panels, applications in car interiors and even illuminated advertising boards. As a UV protective polycarbonate film, the newly developed Makrofol® TP 244 meets their requirements.

The Bayer MaterialScience experts relied on their expertise gathered over many years in the field of polycarbonate sheets to develop the product. Makrolon® sheets are specially designed for exterior applications and can withstand weathering for decades. The tried-and-tested UV protective layer used on the sheets is also applied to Makrofol® TP 244 film by coextrusion. Thanks to this structure, the film far exceeds the requirements of tests such as SAE-J 1885, which simulates the effects of weathering using artificial radiation. Additional tests for exterior applications have already begun. As the protective layer is also based on polycarbonate, the typical characteristics of this material, such as high transparency, heat resistance and dimensional stability, are retained. What's more, Makrofol® TP 244 is easy to process, impact-resistant and can easily be punched.

Harnessing the tried-and-tested technology from Makrolon® sheets brings UV protection to where it's most effective, namely the outer layer. Makrofol® TP 244 enables us to offer a solution for all applications where both lightfastness and the typical properties of polycarbonate films are important.

Attachments: Data Sheet, Safety Data Sheet

This a Product in Developmental stage. Please see disclaimer in attached Data Sheet.

Makrofol[®] TP 244

Description and Application Information

Makrofol TP 244 is a coextruded film based on Makrolon[®] with a specially developed functional layer for UV-protection. It combines the well known advantages of Makrofol[®] with respect to mechanical, thermal and optical properties with the capability for applications under UV-exposure.

the following surface combinations are available: gloss/gloss, gloss/fine matte, fine vervet/very fine matte

Guide Data*

Property	Value	Unit	Test Method
Density	1,2	g/cm ³	ISO 1183, Method C, 20°C
Gauge	250, 375, 500	µm	similar to ISO 4593, 23°C
Gloss		digit	ISO 2813
1-surface (1-1, 1-4)	≥90		Angel 60°
2-surface (6-2)	<50		backprinted black
4--surface (1-4)	<9		
6-surface (6-2)	5±3		
Roughness R _{3z}		µm	sim. to. ISO 4288
1-surface (1-1, 1-4)	≤0,5		Lm 12,5 mm, lc 2,5 mm
2-surface (6-2)	≤10		Average of 5
4-surface (1-4)	3-11		measurements along
6-surface (6-2)	13±3		web width
Visible Inclusions			Internal Method
gels, bubbles, black specs, impurities etc.			35 001
size > 0,635 mm	max. 2 /1m ²		1100-021
size >0,350-0,635 mm	max. 7/1m ²		
size 0,1 - 0,350 mm	max. 7/0,1m ²		

Makrofol[®] TP 244

Property	Value	Unit	Test Method
Light Transmission	≥80	%	O/D Standard light C/2
Tensile strength	≥60	MPa	ISO 527-1,-3
Elongation	≥100	%	ISO 527-1,-3
Youngs modulus	≥2100	MPa	ISO 527-1,-3
Discolouring after UV-Exposure			SAE J 1885, 489kJ/m ²
	-4,5	Δ L	Reflection (8°/d)
	-0,5	Δ a	
	2,3	Δ b	
	4	Δ YI	Transmission (0°/d)
≤1	Δ YI		

*These values provide general information and are not part of the product specification

This Information and our technical advice - whether verbal, in writing or by way of trials - are given in good faith but without warranty, and this also applies where proprietary rights of third parties are involved.

Our advice does not release you from the obligation to verify the information currently provided - especially that contained in our safety data and technical information sheets - and to test our products as to their suitability for the intended processes and uses.

This is a developmental product. Further information, including amended or supplementary data on hazards associated with its use, may be compiled in the future. For this reason no assurances are given as to type conformity, processability, long-term performance characteristics or other production or application parameters. Therefore, the purchaser/user uses the product entirely at his own risk without having been given any warranty or guarantee and agrees that the supplier shall not be liable for any damages, of whatever nature, arising out of such use. Commercialization and continued supply of this material are not assured. Its supply may be discontinued at any time.

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Safety Data Sheet

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***1. Identification of the substance/preparation and the company**

MAKROFOL DE types

Application:
Semi-finished products for the production of plastic articles

Bayer MaterialScience AG, HSEQ-PRC (Product Safety)
51368 Leverkusen, Germany, Tel.: +49 214 30 25026
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In case of emergency: +49 214 30 99300 (Sicherheitszentrale Bayer)
+44 1635 563000 (Bayer UK Ltd,
Responsible Care Group, Newbury RG14 1JA, UK)

2. Composition/information on ingredients

polycarbonate based on bisphenol A

***3. Hazards identification**

Not a product dangerous for health or the environment according to the definition of EC Directives 67/548/EEC or 1999/45/EC and their valid adaptations and derived national regulations.

4. First-aid measures

No special measures required.

5. Fire-fighting measures

Extinguishing media: Water spray, extinguishing powder, CO₂, foam, dry powder.

Firemen have to wear self-contained breathing apparatus.

6. Accidental release measures

Take up mechanically.

***7. Handling and storage**

No special measures required.

VCI storage class: 11 (VCI: German Association of Chemical Industry)

***8. Exposure controls/Personal protection**

The regulations for the substances listed below must be observed when processing this product.

Occupational Exposure Limits (mg/m³), Time Weighted Average:

	EU	U. Kingdom	R. of Ireland	ACGIH
fine dust 1)				
respirable	-	5	4	3
inhalable	-	10	10	10

1) in consequence with mechanical treatment, e.g. grinding, occurring.

ACGIH: American Conference of Governmental Industrial Hygienists
EU: Commission Directive 91/322/EEC and amendment 2000/39/EC

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***8. Exposure controls/Personal protection** (Continuation)

Respiratory protection:

In case of dust formation use respiratory equipment with filter type particle filter P1 according to DIN EN 143.

Hand protection:

Protective gloves of leather, contaminated or damaged gloves should be replaced.

Eye protection:

Protective goggles with side shield or tightly fitting protective goggles

Body protection:

Close fitting occupational clothing is recommended.

Grease skin. At the end of work, wash hands and face.

9. Physical and chemical properties

tested in accordance with

Form:	film	
Colour:	colourless or according to pigmentation	
Odour:	odourless	
Melting range:	220-230 °C	
Softening point:	150-160 °C	
Density:	approx. 1,2 g/cm ³ at 20 °C	DIN 53479
Vapour pressure:	not applicable	
Viscosity:	not applicable	
Solubility in water:	insoluble	
pH value:	not applicable	
Flash-ignition temperature:	> 450 °C	
Self-ignition temperature:	> 450 °C	
Explosive limits:	not applicable	

***10. Stability and reactivity**

Thermal decomposition: Decomposition begins at 380 °C. Fumes evolved by overheating during improperly processing or by burning may be injurious to health.

Hazardous decomposition products: Caused by smouldering and incomplete combustion toxic fumes mainly consisting of CO and CO₂ may be developed. Formation of traces of aliphatic and aromatic hydrocarbons, aldehydes, acids, phenol and phenol-derivatives may occur.

Hazardous reactions: No hazardous reactions observed.

***11. Toxicological information**

This material is not toxic.

***12. Ecological information**

The product is slightly soluble in water (cf. German Regulation on Substances Hazardous to Water (VwVwS), Appendix 3, 5b) and its behaviour is inert on account of its low leachability.

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***13. Disposal considerations**

The product is suitable for mechanical recycling. After appropriate treatment it can be remelted and reprocessed into new moulded articles. Mechanical recycling is only possible if the material has been selectively retrieved and carefully segregated according to type. May be disposed of together with household refuse if local official regulations are observed. May be incinerated if local official regulations are observed.

European Waste Catalogue (EWC) code: 070213

***14. Transport information**

GGVSE: -- UN: NODG PG: --

RID/ADR: -- UN: NODG PG: --

ADNR: -- UN: NODG PG: --

GGVSee/IMDG Code: -- UN: NODG PG: -- MPO: --

ICAO-TI/IATA-DGR: -- UN: NRES PG: --

Declaration for land shipment: --

Declaration for sea shipment: --

Declaration for shipment by air: --

Other information:

Not dangerous cargo. Keep dry.

***15. Regulatory information**

No labeling necessary according to EC Directives 67/548/EEC or 1999/45/EC and their valid adaptations and derived national regulations.

Water pollution class (WGK: Not hazardous to water (VwVwS appendix 1)
(VwVwS = German Regulation on Substances Hazardous to Water)

***16. Other information**

The safety data sheet is also valid for:

MAKROFOL PCVE, - PCVM, - PCEE, - PCSM

MAKROFOL ID

MAKROFOL TF

MAKROFOL VP KU3-1055,- VP 1055

MAKROFOL DP 1217, DP 1218, DP 1219, DP 1227, DP 1248

MAKROFOL LP 057, LP 205, LP 206, LP 207, LP 208, LP 211, LP 213

MAKROFOL TP 220, TP 230, TP 234, TP 235, TP 236, TP 241, TP 242, TP 244

MAKROFOL TP 247

MAKROFOL DPF 5001

MAKROFOL DPF 5003

All chapters in the SDS which have been changed since last edition are marked with an asterisk in front of the Chapter number.

The data given here is based on current knowledge and experience. The purpose of this Safety Data Sheet is to describe the products in terms of their safety requirements. The above details do not imply any guarantee concerning composition, properties or performance.