Bayer MaterialScience

MAKROLON® 1239

Product Information

Polycarbonate Resin

FDA-Quality Blow-Molding Extrusion Grade

Description

Makrolon 1239 resin is a special grade of polycarbonate developed to help provide high melt viscosity at low shear rates and high melt strength, which are necessary for extrusion processing. These rheological characteristics make Makrolon 1239 resin suitable for producing articles by extrusion blow molding or profile extrusion of complicated geometries. Makrolon 1239 resin is available in transparent blue color 550360.

Makrolon 1239 resin complies with FDA food-contact regulations 21 CFR 177.1580 (Polycarbonate Resins) and may be used in contact with all food types. Most colors may be used for all thermal food-contact applications. However, some colors are limited by Conditions of Use B, 21 CFR 175.300 and 176.170, and may not be used when the food is sterilized in the food-contact article under autoclaving conditions. Please contact your Bayer Corporation representative with complete details when food contact is involved.

Makrolon 1239 resin, in transparent blue color 550360, is also listed under NSF standard 51 for use in food equipment. Please consult your Bayer MaterialScience representative for more information about food equipment applications.

Applications

Makrolon 1239 resin has been developed for the production of high-capacity reusable water bottles. Properly blow-molded bottles and containers are lightweight and long-lasting. This resin's toughness and high burst strength help to allow the container to survive rough handling and repeated usage without sacrificing its crystal clarity.

The wide operating temperature range of Makrolon resin means that at the high end, the material can withstand hotter fill temperatures and can be steam-sterilized. At the low end, the material retains its strength and toughness at temperatures far below those found in any food freezer. The high melt strength characteristics of Makrolon 1239 resin help make it an excellent resin for producing profiles of complicated geometries.

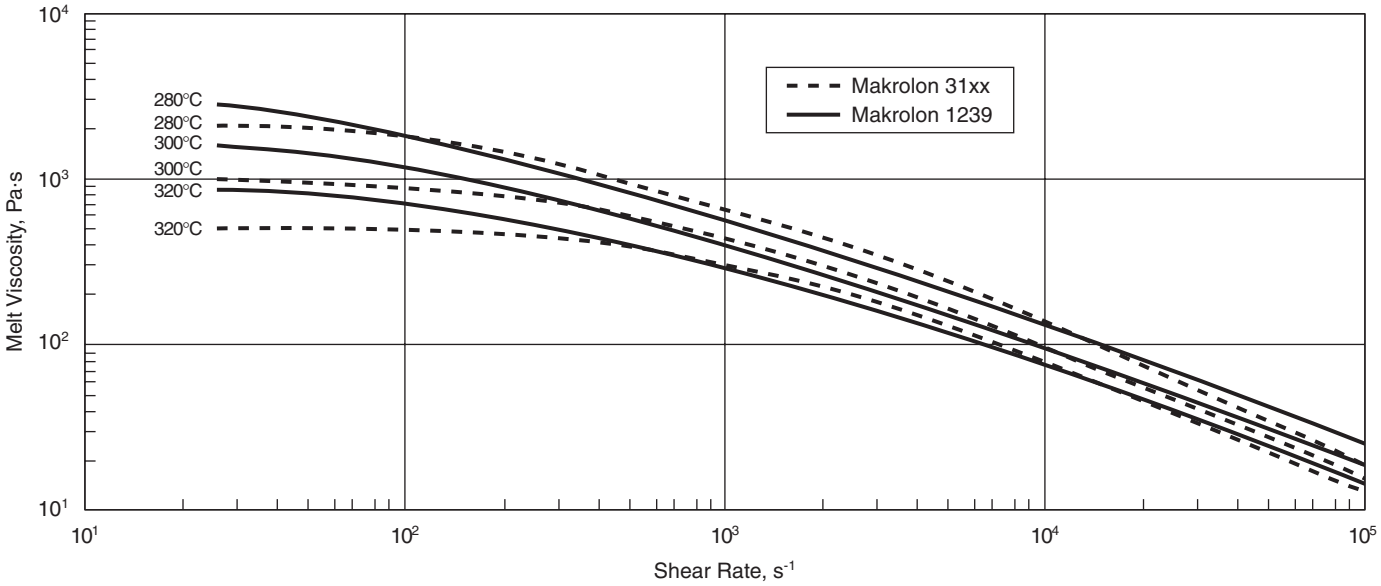
From simple tubing to complex parts, like reverse cove molding, Makrolon 1239 resin helps to provide dimensional stability, strength with lightweight benefits, and excellent color to do the job. As with any product, use of Makrolon 1239 resin in a given application must be tested (including but not limited to field testing) in advance by the user to determine suitability.

Sterilization: Parts molded from Makrolon 1239 resin are sterilizable using radiation, ethylene oxide, or steam autoclaving. When sterilizing with steam, germicides and detergents must be rinsed thoroughly from polycarbonate parts prior to autoclaving. Failure to thoroughly remove germicides and detergents from the part prior to autoclaving may cause accelerated degradation of the polycarbonate.

Steam sterilization temperatures for parts made of Makrolon polycarbonate must not exceed 250º F (121ºC) to avoid part deformation. Please note that permanent immersion of polycarbonate parts in water above 140ºF (60ºC) or in steam causes loss of material properties and must be avoided. Furthermore, condensed steam should not be allowed to accumulate, as this may cause damage to parts. Polycarbonate parts should also be protected from damage by substances such as alkaline corrosion inhibitors, which are frequently added to boiler feed water.

The sterilization method and the number of sterilization cycles an item made from Makrolon 1239 resin can withstand will vary depending upon type/grade of product, part design, processing parameters, sterilization temperature, and chemical environment. Therefore, the Manufacturer must evaluate each device to determine the sterilization method and the number of permissible sterilization cycles appropriate for actual end-use requirements and must adequately advise and warn purchasers and users thereof.

Comparison of Melt Viscosity vs. Shear Rate for Makrolon 1239 and 31xx Resins



Drying

All polycarbonate resins are hygroscopic and must be thoroughly dried prior to processing. A desiccant dehumidifying hopper dryer is recommended. To achieve a moisture content of less than 0.02%, hopper inlet air temperature should be 250°F (121°C) and inlet air dew point should be -20°F (-29°C) or lower. The hopper capacity should be sufficient to provide a minimum residence time of 4 hours. Additional information on drying procedures is available in the Bayer brochure *General Drying Guide.*

Processing

Makrolon 1239 resin can be processed on most modern extrusion lines or extrusion blow molding equipment. Melt viscosity-versus-shear rate curves are shown for Makrolon 1239 resin and Makrolon 31xx resin, a standard grade of polycarbonate, in the graph above.

For extrusion blow molding, extruder requirements and operating techniques are similar to those used for other polymers. In most cases, equipment designed for polyethylene can be adapted to run polycarbonate.

For profile extrusion, the equipment necessary for producing these shapes differs from other polymers in die geometry, method of calibration, and processing parameters. A Bayer technical service representative can help you assess the suitability of your equipment. Specific processing guidelines are available in the Bayer brochure *Makrolon Polycarbonate — A Processing Guide for Extrusion*.

Regrind Usage

Where end-use requirements permit, up to 20% Makrolon resin regrind may be used with virgin material, provided that the material is kept free of contamination and is properly dried (see section on Drying). Any regrind used must be generated from properly extruded parts, trimmings, and/or film. All regrind used must be clean, uncontaminated, and thoroughly blended with virgin resin prior to drying and processing. Under no circumstances should degraded, discolored, or contaminated material be used for regrind. Materials of this type should be properly discarded.

Improperly mixed and/or dried regrind may diminish the desired properties of Makrolon resin. It is critical that you test finished parts produced with any amount of regrind to ensure that your end-use performance requirements are fully met. Regulatory or testing organizations (e.g., UL) may have specific requirements limiting the allowable amount of regrind. Because third party regrind generally does not have a traceable heat history or offer any assurance that proper temperatures, conditions, and/or materials were used in processing, extreme caution must be exercised in buying and using regrind from third parties.

The use of regrind material should be avoided entirely in those applications where resin properties equivalent to virgin material are required, including but not limited to color quality, impact strength, resin purity, and/or load-bearing performance.

Typical Physical Properties* for Natural Resin	ASTM Test Method (Other)	Makrolon® 1239 Resin	
		U.S. Conventional	SI Metric
General			
Specific Gravity	D 792	1.20	
Density	D 792	0.043 lb/in^3	1.20 g/cm^3
Specific Volume	D 792	23.1 in^3/lb	0.83 cm^3/g
Mold Shrinkage	D 955	0.006–0.008 in/in	0.006–0.008 mm/mm
Water Absorption, Immersion at 73°F (23°C):	D 570		
24 Hours		0.12%	
Equilibrium		0.30%	
Melt Flow Rate** at 300°C/1.2-kg Load	D 1238	3 g/10 min	
Optical			
Transmittance at 0.125-in (3.2-mm) Thickness	D 1003	87%	
Haze at 0.125-in (3.2-mm) Thickness	D 1003	< 0.8%	
Refractive Index	D 542	1.587	
Mechanical			
Tensile Stress at Yield	D 638	9,400 lb/in^2	65 MPa
Tensile Stress at Break	D 638	9,400 lb/in^2	65 MPa
Tensile Elongation at Yield	D 638	6.5%	
Tensile Elongation at Break	D 638	100%	
Tensile Modulus (1 mm/min)	D 638	350,000 lb/in^2	2.4 GPa
Flexural Stress at 5% Strain	D 790	12,400 lb/in^2	85 MPa
Flexural Modulus	D 790	340,000 lb/in^2	2.4 GPa
Impact Strength, Notched Izod:	D 256		
73°F (23°C)			
0.125-in (3.2-mm) Thickness		16 ft·lb/in	850 J/m
Rockwell Hardness:	D 785		
M Scale		75	
R Scale		120	
Thermal			
Deflection Temperature, Unannealed:	D 648		
0.250-in (6.4-mm) Thickness			
264-psi (1.82-MPa) Load		266°F	130°C
66-psi (0.46-MPa) Load		280°F	138°C
Coefficient of Linear Thermal Expansion	D 696	3.9 E-05 in/in/°F	7.0 E-05 mm/mm/°C
Thermal Conductivity	C 177	1.39 Btu·in/(h·ft^2·°F)	0.20 W/(m·K)
Specific Heat	D 2766	0.28 Btu/lb·°F	1,172 J/(kg·K)
Vicat Softening Temperature, 50N; 50K/h	D 1525	298°F	148°C
Flammability			
Oxygen Index	D 2863	27%	
Electrical			
Volume Resistivity (Tinfoil Electrodes)	D 257	1.0 E+16 ohm·cm	
Surface Resistivity	D 257	1.0 E+16 ohm	
Dielectric Strength (Short Time under Oil at	D 149		
73°F [23°C] and 1-mm [0.04-in] Thickness)		810 V/mil	32 kV/mm
Dielectric Constant (Tinfoil Electrodes): 60 Hz	D 150	3.0	
1 MHz		2.9	
Dissipation Factor (Tinfoil Electrodes): 60 Hz	D 150	0.0009	
1 MHz		0.01	
Arc Resistance: Stainless Steel Electrodes	D 495	11 s	
Tungsten Electrodes		120 s	

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

*** For information on using melt flow as a quality control procedure, see the Bayer publication* Makrolon Polycarbonate — A Processing Guide for Extrusion.

Regulatory Compliance Information

Some of the end uses of the product described in this bulletin must comply with applicable regulations, such as FDA, NSF, USDA, and CPSC. If you have any questions on the regulatory status of this product, contact your Bayer representative or Bayer's Regulatory Affairs Manager in Pittsburgh, Pa.

General Characteristics of Polycarbonate

Hydrolytic Stability. Parts molded from polycarbonate absorb only 0.15 to 0.19% water at room temperature and 50% relative humidity. Dimensional stability and mechanical properties remain virtually unaffected. Even with immersion in water, dimensional changes measure only about 0.5%. Although frequent, intermittent contact with hot water does not harm polycarbonate, continuous exposure to humidity or water at high temperatures (>140°F/60°C) is not recommended due to hydrolytic degradation, which reduces impact strength and tensile properties.

Gas Permeability. Steam permeability, measured on 100-µm thick film, is 15 $g/m^2 \cdot 24$ h (0.97 $g/100\ in^2 \cdot 24$ h). Significant permeability also exists for other gases, such as hydrogen, carbon dioxide, sulfur dioxide, helium, ethylene oxide, and oxygen.

Chemical Resistance. Polycarbonate is resistant to mineral acids (even in high concentrations), a large number of organic acids, many oxidizing and reducing agents, neutral and acidic saline solutions, some greases and oils, saturated aliphatic and cycloaliphatic hydrocarbons, and most alcohols. It is important to note that polycarbonate is degraded by alkaline solutions, ammonia gas and its solutions, and amines. Polycarbonate dissolves in a number of organic solvents, such as halogenated hydrocarbons and some aromatic hydrocarbons. Other organic compounds cause polycarbonate to swell or stress-crack, e.g., acetone and methyl ethyl ketone. Since chemical resistance to various media is dependent on variables, such as concentration, time, temperature, part design, and residual stresses, the above information should serve only as a guideline. It is imperative that production parts be evaluated under actual application conditions prior to commercial use.

Health and Safety Information

Appropriate literature has been assembled which provides information concerning the health and safety precautions that must be observed when handling Makrolon 1239 resin. Before working with this product, you must read and become familiar with the available information on its hazards, proper use, and handling. This cannot be overemphasized. Information is available in several forms, e.g., material safety data sheets and product labels. Consult your Bayer MaterialScience representative or contact Bayer's Product Safety and Regulatory Affairs Department in Pittsburgh, Pa.

Note: The information contained in this bulletin is current as of June 2002. Please contact Bayer MaterialScience to determine whether this publication has been revised.

Bayer MaterialScience LLC

100 Bayer Road • Pittsburgh, PA 15205-9741 • Phone: 1-800-662-2927 • www.BayerMaterialScienceNAFTA.com

Sales Offices

17320 Redhill Avenue, Suite 175, Irvine, CA 92614-5660 • 1-949-833-2351 • Fax: 1-949-752-1306
1000 Route 9 North, Suite 103, Woodbridge, NJ 07095-1200 • 1-732-726-8988
2401 Walton Boulevard, Auburn Hills, MI 48326-1957 • 1-248-475-7700 • Fax: 1-248-475-7701

139 6/02

Printed on recycled paper