

CALIBRE 201-5

Polycarbonate Resin

Introduction

CALIBRE™ 201-5 resin is designed for extrusion and injection molding products. It exhibits an excellent physical property balance of heat resistance, transparency and impact strength.

Main Characteristics

- FDA¹
- High viscosity
- Food containers
- Appliances
- Good mold release

Applications

- Packaging applications
- Film

Properties ²	Test Method	English		SI	
		Value	Units	Value	Units
Physical					
Melt Flow Rate (300 °C /1.2 kg)	ASTM D 1238	5	g/10 min	5	g/10 min
Density	ASTM D 792	1.20		1,200	kg/m ³
Mold Shrinkage	ASTM D 955	0.005~0.007	in/in	0.005~0.007	mm/mm
Water Absorption @ 24 hrs, 23°C	ASTM D 570	0.15	%	0.15	%
@ equilibrium, 50%RH, 23°C	ASTM D 570	0.32	%	0.32	%
Optical					
Refractive Index, n _D	ASTM D 542	1.586		1.586	
Light Transmittance	ASTM D 1003	89	%	89	%
Haze	ASTM D 1003	0.7~1.5	%	0.7~1.5	%
Thermal					
Deflection Temperature Under Load (DTUL) @ 4 mm @ 66 psi (0.45 MPa), annealed	ASTM D 648	295	°F	146	°C
@ 264 psi (1.8 MPa), annealed		289	°F	143	°C
@ 264 psi (1.8 MPa), unannealed		270	°F	132	°C
Vicat Softening Point, 50°C /hr, 50N Load	ASTM D 1525	304	°F	151	°C
Coefficient of Linear Thermal Expansion, @ -40 to 82°C	ASTM D 696	38 x 10 ⁻⁶	in/in/°F	68 x 10 ⁻⁶	mm/mm/°C
Mechanical					
Tensile Yield Strength ³	ASTM D 638	8,700	psi	60	MPa
Ultimate Tensile Strength	ASTM D 638	10,500	psi	72	MPa
Elongation at Yield	ASTM D 638	6	%	6	%
Elongation at Break	ASTM D 638	150	%	150	%
Tensile Modulus	ASTM D 638	360,000	psi	2,480	MPa
Flexural Strength	ASTM D 790	14,000	psi	96	MPa
Flexural Modulus	ASTM D 790	350,000	psi	2,410	MPa
Notched Izod Impact ⁴ @ 23 °C	ASTM D 256	18	ft-lb/in	950	J/m
Unnotched Izod Impact @ 23 °C	ASTM D 256	No break		No break	
Instrumented Dart Impact ⁵ , Total Energy @ 23 °C	ASTM D 3763	830	in-lb	94	J
Rockwell Hardness	ASTM D 785	118	R Scale	74	M Scale
Taber Abrasion Resistance ⁶ (Δ Haze)	ASTM D 1044	45	%	45	%
Ignition Resistance⁷					
UL-94 @ 0.5 mm	ASTM D635	V-2		V-2	
UL-94 @ 1.6-1.7 mm	ASTM D635	V-2		V-2	
UL-94 @ 3.0 mm	ASTM D635	HB		HB	
Limiting Oxygen Index	ASTM D 2863	26	%	26	%
Ball Indentation Temperature	IEC 598-1	>125	°C	>125	°C
Average Extent of Burning	ASTM D 635	1	in	25	mm
Electrical					
GWT 2.0 mm, 5 second	IEC 695-2-1	850	°C	850	°C
Compression Tracking Index @ 2.0 mm	IEC 112	250	V	250	V
Dielectric Strength	ASTM D 149	420	V/mil	17	KV/mm
Dielectric Constant @ 60 Hz	ASTM D 150	3		3	
Dissipation Factor @ 60 Hz	ASTM D 150	0.001		0.001	
Volume Resistivity @ 23 °C, dry	ASTM D 257	2.0 x 10 ¹⁷	Ω-cm	2.0 x 10 ¹⁷	Ω-cm

1. When used unmodified for the manufacture of food contact articles CALIBRE 201-5 Polycarbonate resins comply with the U.S. Food, Drug, and Cosmetic Act and Food Additive Regulations 21 CFR 177.1580 and E.U. Food Contact Regulations. The uses cited above are subject to GMP (Good Manufacturing Practices) and any limitations that are part of the regulations. The regulations should be consulted for complete details.

2. Typical properties; not to be constructed as specifications.

3. Tensile Test @ 23 °C; 50 mm/min.

4. 0.125 in; 10 mil notch (3.2 mm; 0.25 mm notch).

5. 0.125 in; 8000 ipm (3.2 mm; 203 m/min).

6. 1,000 g; CS-10 F wheel; 500 cycles.

7. These numerical flame spread ratings are small-scale test values and are not intended to reflect hazards presented by these or any other materials under actual fire conditions. UL 94 file: E306922.

NOTICE: This information is presented in good faith, and is believed to be accurate and reliable as of July, 2001, but no warranty, express or implied, is given nor is freedom from any patent owned by The Dow Chemical Company or by others to be inferred. Inasmuch as any assistance furnished by LG Dow Polycarbonate Ltd. with reference to the proper use and disposal of its products is provided without charge. LG-Dow assumes no obligation or liability therefor.

Safety and Handling Considerations

Material Safety Data (MSD) sheets for CALIBRE™ Polycarbonate Resins are available from LG DOW Polycarbonate Ltd. MSD sheets are provided to help customers satisfy their own handling, safety and disposal needs, and those that may be required by locally applicable health and safety regulations, such as OSHA (U.S.A.), MAK (Germany), or WHMIS (Canada). MSD sheets are updated regularly, therefore, please request and review the most current MSD sheet before handling or using any product. The following comments are general and apply only to CALIBRE polycarbonate resins as supplied. Various additives and processing aids used in fabrication and other materials used in finishing steps have their own safe use profile and must be investigated separately.

Hazards and Handling Precautions

CALIBRE polycarbonate resins have a very low degree of toxicity and under normal conditions of use should pose no unusual problems from ingestion, eye or skin contact. However, caution is advised when handling, storing, using, or disposing of these resins and good housekeeping and controlling of dusts are necessary for safe handling of product. Workers should be protected from the possibility of contact with molten resin during fabrication. Handling and fabrication of plastic resins can result in the generation of vapors and dusts. Dusts resulting from sawing, filing, and sanding of plastic parts in post-molding operations may cause irritation to eyes and the upper respiratory tract. In dusty atmospheres, use an approved dust respirator. Pellets or beads may present a slipping hazard. Good general ventilation of the polymer processing area is recommended. Processing may release fumes that may include polymer fragments and other decomposition products. Fumes can be irritating. At temperatures exceeding melt temperature, polymer fragments can occur. Processing improperly dried resin can result in the production of bisphenol A. Good general ventilation should be sufficient for most conditions. Local exhaust ventilation may be necessary for some operations. Use safety glasses. If there is a potential for exposure to particles, which could cause mechanical injury to the eye, wear chemical goggles. If vapor exposure causes eye discomfort, use a full-face respirator. No other precautions other than clean body covering clothing should be needed for handling CALIBRE polycarbonate resins. Use gloves with insulation for thermal protection, when needed.

Medical Application Policy

LG-DOW will not knowingly sell or sample any products into any commercial or developmental application that is intended for:

- Long-term contact with internal body fluids or internal body tissues (long-term is a use which exceeds 72 continuous hours);
- Use in cardiac prosthetic devices regardless of the length of time involved (cardiac prosthetic devices include, but are not limited to: pacemaker leads and devices, artificial hearts, heart valves, intra-aortic balloons and control systems, and ventricular bypass assisted devices);
- Use as a critical component in medical devices that support or sustain human life; or
- Use specifically by pregnant women or in applications designed specifically to promote or interfere with human reproduction.

In addition, for LG-DOW products, new business opportunities require a business assessment prior to sale or sampling of LG-DOW products. Authorized distributors and resellers will adhere to the LG-DOW medical policy.

LG-DOW does not endorse or claim suitability of its products for specific medical applications. It is the responsibility of the medical device or pharmaceutical manufacturer to determine that the LG-DOW product is safe, lawful, and technically suitable for the intended use. **LG-DOW MAKES NO WARRANTIES, EXPRESS OR IMPLIED, CONCERNING THE SUITABILITY OF ANY LG-DOW PRODUCT FOR USE IN MEDICAL APPLICATIONS.**

If products are described as "experimental" or "developmental": 1) product specifications may not be fully determined; 2) analysis of hazards and caution in handling and use are required; and 3) there is greater potential for LG-DOW to change specifications and/or discontinue production.

Combustibility

Although CALIBRE polycarbonate resins may contain ignition resistant chemical additives, these resins will burn and, once ignited, may burn rapidly under the right conditions of heat and oxygen supply. Do not permit dust to accumulate. Dust layers can be ignited by spontaneous combustion or by other ignition sources. When suspended in air, dust can pose an explosion hazard. Dense black smoke is produced when product burns. Toxic fumes are released in fire situations. Fire fighters should wear positive-pressure, self-contained breathing apparatus and full protective equipment. Water or water fog is the preferred extinguishing media. Foam, alcohol resistant foam, carbon dioxide, or dry chemicals may also be used. Soak thoroughly with water to cool and prevent reignition.

Disposal

DO NOT DUMP INTO ANY SEWERS, ON THE GROUND, OR INTO ANY BODY OF WATER. For unused or uncontaminated material, the preferred options include sending to a licensed recycler, reclaimer, incinerator or other thermal destruction device. LG DOW POLYCARBONATE LTD. HAS NO CONTROL OVER THE MANAGEMENT PRACTICES OR MANUFACTURING PROCESSES OF PARTIES HANDLING OR USING THIS MATERIAL. THE INFORMATION PRESENTED HERE PERTAINS ONLY TO THE PRODUCT AS SHIPPED IN ITS INTENDED CONDITION AS DESCRIBED IN THE MSD SHEET COMPOSITION SECTION. For used or contaminated material, the disposal options remain the same, although additional evaluation is required (see, for example, in the U.S.A., 40 CFR, Part 261, "Identification and Listing of Hazardous Waste"). All disposal methods must be in compliance with Federal, State/Provincial, and local laws and regulations.

Environment

Generally speaking, in the environment, lost pellets are not a problem except under unusual circumstances - when they enter the marine environment. They are inert and benign in terms of their physical environmental impact, but if ingested by waterfowl or aquatic life, they may mechanically cause adverse effects. Spills should be minimized and they should be cleaned up when they happen. Plastics should not be discarded into the ocean or any other body of water.

Product Stewardship

LG DOW Polycarbonate Ltd. has a fundamental concern for all, who make, distribute and use its products, and for the environment in which we live. This concern is the basis of our Product Stewardship philosophy, by which we assess the health and environmental information on our products and then take appropriate steps to protect employee and public health and the environment. Our Product Stewardship program rests with every individual involved with LG-DOW products from initial concept and research to the manufacture, sale, distribution, and disposal of each product.

Customer Notice

LG-DOW encourages its customers and potential users of LG-DOW products to review their applications for such products from the standpoint of human health and environmental quality. To help ensure that LG-DOW products are not used in ways for which they are not intended or tested, LG-DOW personnel will assist customers in dealing with ecological and product safety considerations. Your LG-DOW sales representative can arrange the proper contacts. LG-DOW literature, including Material Safety Data sheets, should be consulted prior to the use of LG-DOW products. These are available from your LG-DOW representative. NOTICE: No freedom from any patent owned by LG-DOW or others is to be inferred. Because use conditions and applicable laws may differ from one location to another and may change with time, Customer is responsible for determining whether products and the information in this document are appropriate for Customer's use and for ensuring that Customer's workplace and disposal practices are in compliance with applicable laws and other governmental enactments. LG-DOW assumes no obligation or liability for the information in this document. **NO WARRANTIES ARE GIVEN; ALL IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE ARE EXPRESSLY EXCLUDED.**



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