

# ECCtreme™ ECA 2000

## Fluoroplastic Resin

## Product Information

### Description

ECCtreme™ ECA<sup>1</sup> 2000 fluoroplastic resin is a class of perfluoroplastic specifically designed for use in extreme applications requiring an operating temperature up to 300 °C (572 °F) in combination with excellent electrical properties and/or chemical resistance. Chemours developed ECCtreme™ ECA 2000 fluoroplastic resin in response to industry demand for a melt-extrudable, high-temperature fluoroplastic resin for molding applications. ECCtreme™ ECA 2000 fluoroplastic resin has been recognized as a 300 °C (572 °F) rated material per UL746B<sup>2</sup> by Underwriters Laboratories. Compared with ECCtreme™ ECA 3000 fluoroplastic resin, ECCtreme™ ECA 2000 fluoroplastic resin has a lower melt-flow rate (MFR), making it ideal for extruded sheet and molding applications requiring increased stress-crack resistance. ECCtreme™ ECA 2000 fluoroplastic resin can also be extruded into sheets, rods, or tubing, as well as into compression and transfer molded parts.

ECCtreme™ ECA 2000 fluoroplastic resin can be melt-processed using standard high-temperature fluoroplastic equipment, at standard operating speeds, and possesses physical, electrical, and chemical properties characteristic of polytetrafluoroethylene (PTFE). Its features include:

- UL rated for 300 °C (572 °F)
- High melting point of -320 °C (608 °F)
- Excellent dielectric properties
- Excellent chemical and permeation resistance

<sup>1</sup>Epitaxial Co-Crystallized Alloy

<sup>2</sup>UL Yellow Card (E54681) for 300 °C (572 °F) rating is based on UL 746B testing; for wire and cable applications, 300 °C (572 °F) rating is referenced in UL 1581 and UL 758. Not a guarantee of performance; see section "Important Notice."

In addition, ECCtreme™ ECA 2000 fluoroplastic resin demonstrates enhanced properties (e.g., higher melting point, increased melt viscosity, improved stress crack resistance) when subjected to post-processing heat treatment as shown in Table 1. This effect, known as epitaxial co-crystallization (ECC), occurs when the resin is heated between 290–300 °C (554–572 °F) for a prolonged period. This post-processing heat treatment offers a unique combination of higher stress crack resistance in combination with higher crystallinity, which is favorable to lower permeation. Furthermore, this grade offers improved creep resistance versus conventional fluoroplastics.

### Safety Precautions

WARNING! VAPORS CAN BE LIBERATED THAT MAY BE HAZARDOUS IF INHALED.

Before using ECCtreme™ ECA 2000 fluoroplastic resin, refer to the Safety Data Sheet and the latest edition of "The Guide to the Safe Handling of Fluoropolymer Resins," published by The Society of the Plastics Industry, Inc. ([www.fluoropolymers.org](http://www.fluoropolymers.org)) or by Plastics Europe ([www.plasticseurope.org](http://www.plasticseurope.org)).

Open and use containers only in well-ventilated areas using local exhaust ventilation (LEV). Vapors and fumes liberated during hot processing of ECCtreme™ ECA 2000 fluoroplastic resin should be exhausted completely from the work area. Contamination of tobacco with these fluoroplastics must be avoided. Vapors and fumes liberated during hot processing that are not properly exhausted, or from smoking tobacco or cigarettes contaminated with ECCtreme™ ECA 2000 fluoroplastic resins, may cause flu-like symptoms, such as chills, fever, and sore throat. This may not occur until several hours after exposure and will typically pass within about 24 hr.

Mixtures with some finely divided metals, such as magnesium or aluminum, can be flammable or explosive under some conditions.

### Storage and Handling

The properties of ECCtreme™ ECA 2000 fluoroplastic resin are not affected by storage time. Ambient storage conditions should be designed to avoid airborne contamination and water condensation on the resin when it is removed from containers.

### Freight Classification

ECCtreme™ ECA 2000 fluoroplastic resin is classified as "Plastics, Materials, Pellets."

### Packaging

ECCtreme™ ECA 2000 fluoroplastic resin is supplied in 25 kg, single layer, plastic bags.

### Processing Guidelines

ECCtreme™ ECA 2000 fluoroplastic resin can be processed by conventional fluoroplastic melt extrusion and by compression and transfer molding processes. For detailed processing information, including recommended draw-down ratios (DDR) and molding parameters, consult your Chemours representative. For recommendations specific to transfer molding, consult the ECCtreme™ ECA addendum to the Teflon™/Tefzel™ Transfer Molding Guide.

### Extrusion Equipment

ECCtreme™ ECA 2000 fluoroplastic resin is fabricated using the same melt-processing techniques as other thermoplastics. A brief description of the extrusion equipment used with ECCtreme™ ECA 2000 fluoroplastic resins is given here; for more detailed processing information, consult the Chemours bulletin "Teflon™/Tefzel™ Melt Extrusion Guide," which can be obtained from your Chemours representative. Molten fluoroplastic resins are corrosive to many metals; therefore, special corrosion-resistant materials must be used for all parts of extrusion equipment that come into contact with the melt. Corrosion is likely to occur if dead spots exist in the equipment, processing temperatures are too high, or hold-up time is too long. In addition, resin degradation

will accelerate corrosion. Nickel-based alloys, such as Hastelloy<sup>3</sup>, Inconel<sup>4</sup>, Monel<sup>4</sup>, and Xaloy<sup>5</sup>, are the materials of choice. Hardened nickel plate can be used; but, even small holes, chips, or cracks in the plating can compromise its performance. Chrome-plated materials are not recommended. Additional information on materials of construction can be obtained from your Chemours representative. Extruder barrels should be long, relative to diameter, to provide residence time for heating the resin to approximately 390 °C (730 °F). A 1.5–2.5 inch extruder with a barrel length to diameter ratio of 24:1 or higher is recommended for larger diameter extruders and 30:1 for smaller diameter extruders extruding ECCtreme™ ECA 2000 fluoroplastic resins. Extruder barrels should have four to five independently controlled heater zones with temperature controllers capable of accurate operation ( $\pm 0.6$  °C [ $\pm 1$  °F]) in the temperature range of 316–425 °C (600–800 °F). Heaters should be made of cast bronze or aluminum. Controllers with proportional-integral-derivative (PID) action or equivalent are recommended. A melt thermocouple and melt pressure probe should be installed in the adapter section of the extruder. To obtain an accurate measurement, the thermocouple should protrude into the melt flow sufficient to measure its temperature, not the metal surrounding it. Degradation of the resin during processing greatly reduces the performance of ECCtreme™ ECA 2000 fluoroplastic resins in stringent applications. Degradation is caused by excessively high melt temperatures, long residence time in the extruder, and/or excessive shear from the screw. In general, increases in the MFR greater than 10% during extrusion should be avoided. Other processing conditions that can reduce the resin's performance include melt fracture, very low or uneven melt temperatures, and the presence of hydrocarbon or silicone oils, which act as stress-crack promoters. It is strongly recommended that an ECCtreme™ ECA 2000 fluoroplastic resin-based color concentrate be selected for custom-colored applications. Use of alternative materials in the color concentrate could result in a reduction in the physical properties of ECCtreme™ ECA 2000 fluoroplastic resin, as well as decreased processibility.

<sup>3</sup>Hastelloy is a registered trademark of Cabot Corporation, Kokomo, IN.

<sup>4</sup>Inconel and Monel are registered trademarks of International Nickel Company, Huntington, WV.

<sup>5</sup>Xaloy is a registered trademark of Xaloy Inc., New Brunswick, NJ.

**Table 1: Typical Property Data for ECCtreme™ ECA 2000 Fluoroplastic Resin**

Property	Test Method		Unit	Typical Value	
Upper Continuous Use Temperature <sup>1</sup>	UL 746B		°C (°F)	300 (572)	
				ECCtreme™ ECA 2000 Neat (As sold)	ECCtreme™ ECA 2000 After Heat Treatment <sup>2</sup>
<b>Thermal</b>					
Melt-Flow Rate	ISO 12086	ASTM D1238	g/10 min	3	1-2
Melting Point		ASTM D4591	°C (°F)	317 (603)	322 (612)
<b>Mechanical</b>					
Tensile Strength 23 °C (73 °F) 200 °C (392 °F) 300 °C (572 °F)	ISO 12086	ASTM D1708	MPa (psi)	28 (2,016) 14 (609) 5 (232)	30 (2,045) 16 (595) 7 (276)
Ultimate Elongation 23 °C (73 °F) 200 °C (392 °F) 300 °C (572 °F)	ISO 12086	ASTM D1708	%	350 500 650	380 600 800
Tensile Modulus 23 °C (73 °F) 200 °C (392 °F) 300 °C (572 °F)	ISO 12086	ASTM D1708	MPa (psi)	430 (62,192) 65 (10,000) 15 (2,756)	550 (81,772) 85 (12,908) 18 (2,901)
MIT Folding Endurance <sup>3</sup>	—	ASTM D2176 <sup>4</sup>	Cycles	150,000	>1,000,000
Hardness Durometer	ISO 868	ASTM D2240	Shore D	D55	D55
Impact Strength, Notched Izod, -41 °C (-42 °F)	ISO 180	ASTM D256	ft-lb/in	No Break	No Break
Impact Strength, Unnotched Izod, 100 °C (212 °F)	ISO 180	ASTM D4812	ft-lb/in	No Break	No Break
<b>Electrical</b>					
Dielectric Constant, 23 °C (73 °F) 100 Hz 1 MHz	IEC 250	ASTM D150	—	2.05 2.05	2.05 2.05
Dissipation Factor, 23 °C (73 °F) 100 Hz 1 MHz	IEC 250	ASTM D150	—	<0.00005 <0.00015	<0.00005 <0.00009
<b>Other</b>					
Flammability Classification <sup>5</sup>	—	UL 94		V-0	V-0

Note: Typical properties are not suitable for specification purposes.

<sup>1</sup>Upper continuous use temperature is based on UL 746B testing; see UL E54681.

<sup>2</sup>Typical heat treatment indicates 10 days at 300 °C (572 °F).

<sup>3</sup>Depending on fabrication conditions.

<sup>4</sup>Historical standard.

<sup>5</sup>These results are based on laboratory tests under controlled conditions and do not reflect performance under actual fire conditions; current rating is a typical theoretical value.

**IMPORTANT NOTICE**

ECCtreme™ ECA 2000 fluoroplastic resin is a new product targeting extreme applications that require properties beyond the operating limits of typical perfluoroplastics. As a result, the performance characteristics and other properties of this product are not guaranteed, and the User is responsible for evaluating and determining whether this Chemours product is suitable and appropriate for a particular use and intended application. The conditions of evaluation, selection, and use of the Chemours product can vary widely and affect the use and intended application of the Chemours product. Because many of these conditions are uniquely within the User's knowledge and control, User must evaluate and determine whether the Chemours product is suitable and appropriate for a particular use and intended application.

**CAUTION:** Do not use Chemours materials in medical applications involving permanent implantation in the human body or contact with bodily fluids or tissues, unless the material has been provided from Chemours under a written contract that is consistent with Chemours policy regarding medical applications and expressly acknowledges the contemplated use. For further information, please contact your Chemours representative. For medical emergencies, spills, or other critical situations, call (866) 595-1473 within the United States. For those outside of the United States, call (302) 773-2000.

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