

# Ingeo™ Biopolymer 8052D Technical Data Sheet

## Foam Grade

### Foam Characteristics/ Applications

Ingeo 8052D – a product from NatureWorks LLC – can be converted into an expanded foam sheet with use temperatures up to 77°F (25°C). This foam is lightweight, strong and suitable for packaging fresh meat and vegetables. In order to extrude foam with the desired expansion properties, this grade must be modified with a branching agent such as Joncryl® 4368C.

### Polymer Characteristics

Ingeo biopolymer is available in pellet form. Drying prior to processing is essential. The polymer is stable in the molten state, provided that the extrusion and drying procedures are followed.

### Machine Configuration

Ingeo biopolymers will process on conventional tandem foam extrusion lines provided modifications are made to account for the inherent differences in polymer properties. More details are available in the companion process guide but at a minimum, the line must be equipped with a drying system, new secondary extrusion screw, and enhanced cooling on the mandrel.

### Process Details

#### Startup and Shutdown

8052D is not compatible with poly-styrene resin, and special purging sequences should be followed:

1. Clean extruder and bring temperatures to steady state with low-viscosity, general-purpose polystyrene.
2. Vacuum out hopper system to avoid contamination.
3. Introduce Ingeo polymer into the extruder at the operating conditions used in Step 1.
4. Once Ingeo polymer has purged, reduce barrel temperatures to desired set points.
5. At shutdown, purge machine with high-viscosity polystyrene.

### Processing

Ingeo 8052D modified with branching agent is a highly viscous polymer and therefore special attention should be paid to motor loads to prevent equipment damage. Please

### Typical Material & Application Properties <sup>(1)</sup>

Physical Properties	Ingeo Resin	ASTM Method
Specific Gravity	1.24	D792
Melt Index, g/10 min (210°C, 2.16kg)	14	D1238
Relative Viscosity	3.3	D5225
Crystalline Melt Temperature (°C)	145-160	D3418
Glass Transition Temperature (°C)	55-60	D3418
Clarity	Transparent	
Mechanical Properties		
Tensile Yield Strength, psi (MPa)	9,000 (62)	D638
Tensile Elongation, %	3.5	D638
Notched Izod Impact, ft-lb/in (J/m)	0.3 (16.0)	D256
Flexural Strength (MPa)	15,700 (108)	D790
Flexural Modulus (MPa)	515,000 (3,600)	D790

(1) Typical properties; not to be construed as specifications.

refer to the Ingeo foam extrusion guide for complete recommendations on how to process Ingeo sheet foam.

### Drying

In-line drying is required. A moisture content of less than 0.005% (50ppm) is recommended to prevent viscosity degradation. Typical drying conditions are 3 hours at 165°F (75°C) or to a dew point of -40°F (-40°C),

with an airflow rate greater than 0.5 cfm/lb of resin throughput. The resin should not be exposed to atmospheric conditions after drying. Keep the package sealed until ready to use and promptly reseal any unused material.

### Processing Temperature Profile <sup>(1)</sup>

Melt Temperature	390°F	200°C
Feed Throat	70°F	20°C
Feed Temperature	330°F	165°C
Compression Section	380°F	195°C
Metering Section	400°F	205°C
Nozzle	400°F	205°C
Mold	75°F	25°C
Screw Speed	100-175 rpm	
Back Pressure	50-100 psi	3.5-6.9 bar
Mold Shrinkage	.004 in/in. +/- .001	

(1) These are starting points and may need to be optimized. For thin walled molding temperatures up to 450°F may be required.

### Safety and Handling Considerations

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Safety Data Sheets (SDS) for Ingeo biopolymers are available from NatureWorks. SDS's 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. SDS's are updated regularly; therefore, please request and review the most current SDS's before handling or using any product.

*The following comments apply only to Ingeo biopolymers; 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

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Ingeo biopolymers have a very low degree of toxicity and, under normal conditions of use, should pose no unusual problems from incidental ingestion or eye and 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. Pellets or beads may present a slipping hazard.

No other precautions other than clean, body-covering clothing should be needed for handling Ingeo biopolymers. Use gloves with insulation for thermal protection when exposure to the melt is localized. Workers should be protected from the possibility of contact with molten resin during fabrication.

Handling and fabrication of resins can result in the generation of vapors and dusts that may cause irritation to eyes and the upper respiratory tract. In dusty atmospheres, use an approved dust respirator.

Good general ventilation of the polymer processing area is recommended. At temperatures exceeding the polymer melt temperature (typically 175°C), polymer can release fumes, which may contain fragments of the polymer, creating a potential to irritate eyes and mucous membranes. Good general ventilation should be sufficient for most conditions. Local exhaust ventilation is recommended for melt operations. Use safety glasses (or goggles) to prevent exposure to particles, which could cause mechanical injury to the eye. If vapor exposure causes eye discomfort, improve localized fume exhausting methods or use a full-face respirator.

The primary thermal decomposition product of PLA is acetaldehyde, a material also produced during the thermal degradation of PET. Thermal decomposition products also include carbon monoxide and hexanal, all of which exist as gases at normal room conditions. These species are highly flammable, easily ignited by spark or flame, and can also

auto ignite. For polyesters such as PLA, thermal decomposition producing flammable vapors containing acetaldehyde and carbon monoxide can occur in almost any process equipment maintaining PLA at high temperature over longer residence times than typically experienced in extruders, fiber spinning lines, injection molding machines, accumulators, pipe lines and adapters. As a rough guideline based upon some practical experience, significant decomposition of PLA will occur if polymer residues are held at temperatures above the melting point for prolonged periods, e.g., in excess of 24 hours at 175°C, although this will vary significantly with temperature.

### Combustibility

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Ingeo biopolymers will burn. Clear to white smoke is produced when product burns. Toxic fumes are released under conditions of incomplete combustion. Do not permit dust to accumulate. Dust layers can be ignited by spontaneous combustion or other ignition sources. When suspended in air, dust can pose an explosion hazard. Firefighters should wear positive-pressure, self-contained breathing apparatuses and full protective equipment. Water or water fog is the preferred extinguishing medium. Foam, alcohol-resistant foam, carbon dioxide or dry chemicals may also be used. Soak thoroughly with water to cool and prevent re-ignition.

### Disposal

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DO NOT DUMP INTO ANY SEWERS, ON THE GROUND, OR INTO ANY BODY OF WATER. For unused or uncontaminated material, the preferred option is to recycle into the process otherwise, send to an incinerator or other thermal destruction device. For used or contaminated material, the disposal options remain the same, although additional evaluation is required. Disposal must be in compliance with Federal, State/Provincial, and local laws and regulations.

### Environmental Concerns

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Generally speaking, lost pellets, while undesirable, are benign in terms of their physical environmental impact, but if ingested by wildlife, 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 environment.

### Product Stewardship

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NatureWorks has a fundamental duty to all those that use our products, and for the environment in which we live. This duty is the basis for our Product Stewardship philosophy, by which we assess the health and environmental information on our products and their intended use, and then take

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appropriate steps to protect the environment and the health of our employees and the public.

### **Customer Notice**

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NatureWorks encourages its customers and potential users of its products to review their applications from the

standpoint of human health and environmental quality. To help ensure our products are not used in ways for which they were not intended or tested, our personnel will assist customers in dealing with ecological and product safety considerations. Your sales representative can arrange the proper contacts. NatureWorks literature should be consulted prior to the use of the company's products.

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