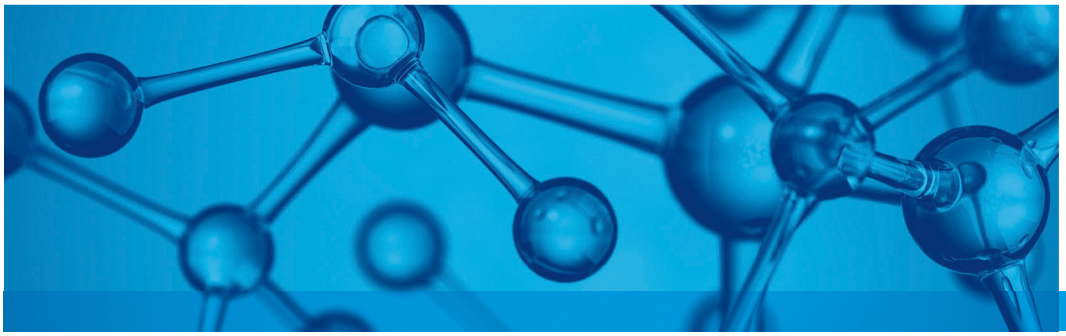

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Ryton® PPS Processing Guide for High-Performance Fibers

High-performance fibers made from Ryton® polyphenylene sulfide (PPS) are used in applications that require resistance to heat and chemicals, hydrolytic stability and flame retardant properties.

Filtration media fabricated from PPS-based staple fibers, multifilaments and monofilaments have become a standard in many applications used in severe end-use environments, such as filtration bags for coal fired boiling filters.

Typical filtration applications

- Hot liquid and gas filtration
- Fuel and oil filtration
- Paper machine clothing
- Braided sleeving
- Woven filtration media

Ryton® PPS Fiber Resins

Solvay offers three fiber resin grades for the production of staple fiber, multifilament and monofilament. An overview of these products and their typical properties are presented in Tables 1 and 2 respectively.

With over 40 years of experience as a leading materials supplier to the fiber industry, Solvay provides the commitment, innovation and technical support our customers need to stay competitive in today's marketplace.

Processing Parameters

General processing recommendations for extruding Ryton® PPS fiber resins are outlined below. Please contact your Solvay representative if you have questions or need additional information.

Extruder setup

- 24:1 to 28:1 L/D
- 2.5:1 to 3:1 compression ratio metering screw (general purpose). Mixing head is optional.
- 20/80/20 screen pack
- Rupture disk
- Heated die clamp

Extrusion die

- Low volume, high compression die head suitable for low melt viscosity materials
- Die bushing ID should be 1.4 to 1.6 times the tubing diameter

Material drying

- Dry between 80 to 85 °C (175 to 185°F) for 4 to 6 hours prior to processing. For shorter times, temperatures up to 140 °C (284 °C) can be used.
- Hopper driers and/or desiccant driers with a –40 °C (–40 °F) dew point are recommended.

Starting temperature profiles

Extruder zone 1	288 °C (550 °F)
Extruder zone 2	315 °C (600 °F)
Extruder zone 3	330 °C (626 °F)
Adaptor	293 °C (560 °F)
Die 1	293 °C (560 °F)
Die 2	293 °C (560 °F)

Processing Considerations

Allow enough extruder heating soak time at startup to ensure that the breaker plate and screen packs have reached processing temperatures. Cold breaker plates can cause the extrudate to freeze off at the screen pack and block the extruder output, resulting in excessively high extruder pressures.

Ryton® PPS fiber resins process better at higher extruder rates as the shear from the screw does more to melt the polymer than do the heaters. Extruders should be sized to run above 50 % capacity in order to generate sufficient shear heating while minimizing residence time.

Bubbles, smoke or gels indicate that the material has overheated and been in the extruder too long. Adjust the temperatures as needed, keeping in mind that dies should not be set below 282 °C (540 °F). If the melt temperatures need to be lowered, it is preferable to lower the extruder temperature profile instead of lowering the die temperatures.

Sustained melt temperatures above 315 °C (600 °F) for prolonged time periods can lead to thermal degradation of the resin on the screen pack and result in unacceptably high extruder pressures.

Purging Procedure

Equipment should be purged at processing temperatures using a fractional melt flow HDPE (such as Marlex® HHM 50100). After purging with HDPE, run the extruder dry. While the extruder and die are still at processing temperature, break down and clean the die. If necessary, the screw should be pulled and cleaned while hot, as well as the barrel.

Safety

All appropriate safety precautions and proper protective equipment, including gloves, should be used at all times. Off-gas products produced during processing can be an irritant to mucous membranes; therefore, adequate ventilation is recommended.

Table 1: Ryton® PPS fiber resins

Grade	Fiber Type	Application	Key Characteristics
QC220N powder QC220P pellet	Staple fibers	Nonwoven fabrics used in hot gas filtration	Thermal resistance Chemical resistance
QC210N powder	Multifilaments	Multifilaments used in hot liquid and hot gas filtration	Chemical resistance Inherently flame retardant
QC200N powder QC200P pellet	Monofilaments	Paper machine clothing Braided sleeving Woven filtration media	Chemical resistance Hydrolytic stability

Table 2: Typical properties of Ryton® PPS fiber resins*

Grade	Value	Unit	Test Method
Melt mass-flow rate** at 316 °C, 5 kg			ASTM D1283
QC200	100	g/10 min	
QC210	135	g/10 min	
QC220	175	g/10 min	
Ash content	<0.3	wt %	ISO 3451-1
Volatiles at 150 °C	<0.3	wt %	
Weight loss on heating at 300 °C	<0.5	wt %	
Melting temperature	285 (545)	°C (°F)	ISO 11357-3
Heat deflection temperature at 1.8 MPa	105 (221)	°C (°F)	ASTM D648
CLTE, flow at –50 to 50 °C	5.0E-05 (2.8E-05)	cm/cm/°C (in/in/°F)	ASTM E831
Tensile strength	85 (12,300)	Mpa (psi)	ASTM D638
Tensile elongation at break	10	%	ASTM D638
Dielectric strength	24 (610)	kV/mm (V/mil)	ASTM D149
Dielectric constant at 25 °C, 1 MHz	3.2		ASTM D150
Dissipation factor at 25 °C, 1 MHz	2.0E-03		ASTM D150
Volume resistivity	1.0E+16	ohm-cm	ASTM D257
Specific gravity	1.35	%	ASTM D792
Moisture absorption at equilibrium	0.05		ASTM D570
Color L*	> 90		Internal Method

** Typical properties are not to be construed as specifications*
*** Procedure B*

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