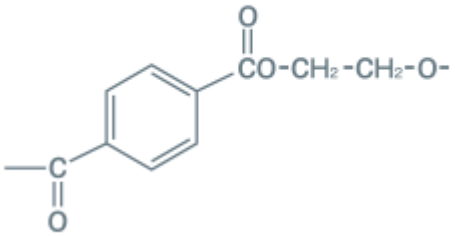
Features

Thermoplastic polyester resin VYLOPET™

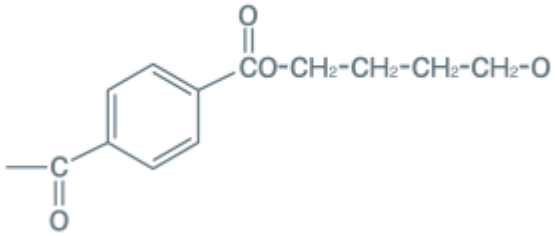
- Mechanical properties are not compromised by water absorption
- Minimal dimensional changes with ambient temperature
- Can be used in high heat applications
- Easy to achieve an excellent surface appearance
- High flow properties enable thin-wall molding
- Excellent electrical properties
- Recyclable

Chemical Structure

Structural formula of PET



Structural formula of PBT



Spec・Quality

VYLOPET™ Main Grades

The physical properties can be found in the Product **search** on the top page of VYLOPET™.

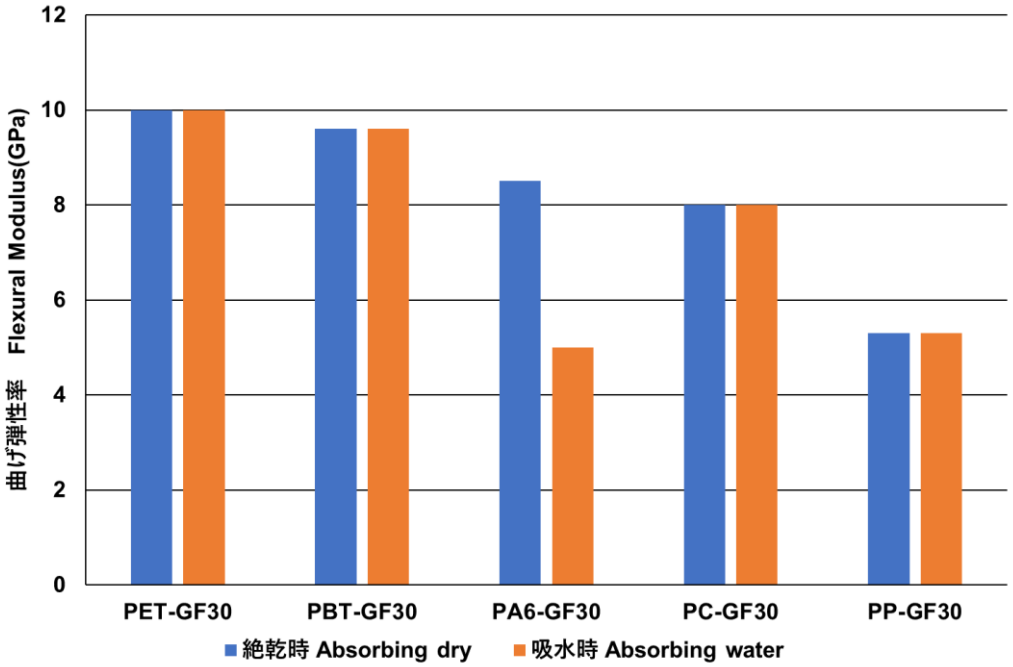
Type	Property	Grade	Feature
PET	GF Reinforced	EMC-330K	GF30%, High Cycle
	Flame Retardant	EMC-133T	GF30%, Flame Retardant (V-0 Equivalent Rating/1.6mm/IEC60695-11-10), Hydrolysis Resistant
PBT/PET	GF Reinforced	EMC-430X-8	GF30%, Good Appearance
	GF Reinforced	EMC-445	GF40%, Good Appearance
	High Stiffness	EMC-450	GF55%, High Stiffness, Good appearance
	High Stiffness	EMC-060A	GF60%, High Stiffness, Good appearance
	Low Warpage	EMC-405AX-14A	MD20%, Low Warpage、High Flow
	Flame Retardant	EMC-617Y	(GF+MD)35%, Flame Retardant (V-0 Equivalent Rating/3.2mm/IEC60695-11-10)
PBT	Unreinforced	EMC-701EXT	Unreinforced, High Cycle, Low to No Outgassing
	GF Reinforced	EMC-HF715	GF15%, Easy Welding
	GF Reinforced	EMC-736P	GF30%, Easy Welding
	GF Reinforced	EMC-730L	GF30%, Hydrolysis Resistant

Comparison to Other Resins

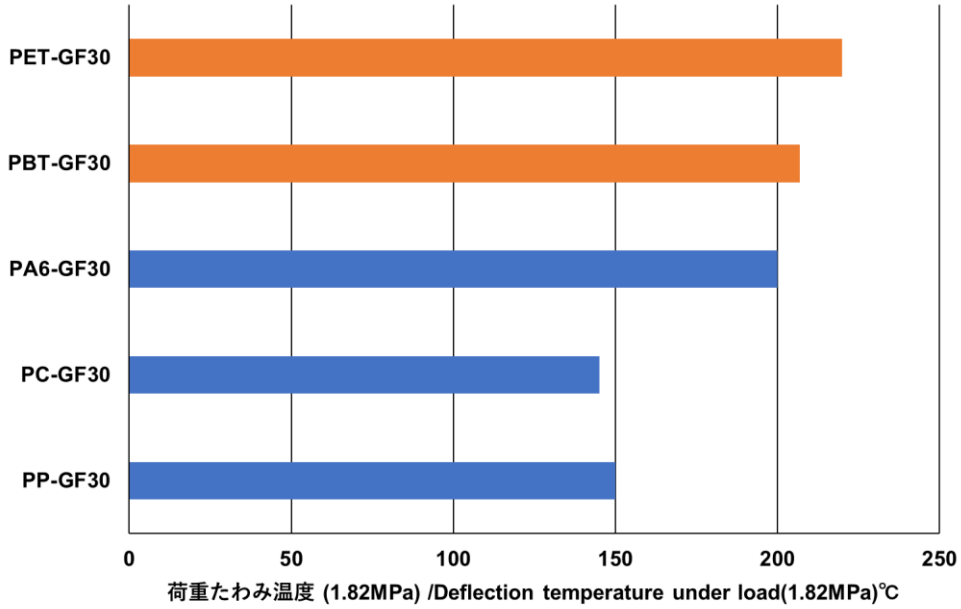
Item	Polyester		Polyamide		PC	PP
	PET	PBT	PA6	PA66		
Heat resistance	Excellent	Average	Average	Excellent	Fair	Poor
Flammability	Average	Average	Excellent	Excellent	Average	Average
Rigidity	Excellent	Average	Average	Average	Average	Poor
Impact resistance	Poor	Poor	Average	Average	Excellent	Average
Fatigue endurance	Good	Good	Average	Average	Poor	Average
Organic solvent resistance	Excellent	Excellent	Excellent	Excellent	Poor	Excellent
Mild acid resistance	Excellent	Excellent	Average	Average	Excellent	Excellent
Weak alkali resistance	Average	Average	Average	Average	Average	Excellent
Electrical properties	Excellent	Excellent	Poor	Poor	Excellent	Excellent
Dimensional Accuracy	Average	Average	Poor	Poor	Excellent	Average

Spec・Quality

Dry/Conditioned Flexural Modulus for Various Materials



Heat Deflection Temperature of Various Materials



VYLOPET™ Processing Conditions

Molding Conditions

Pre-Drying

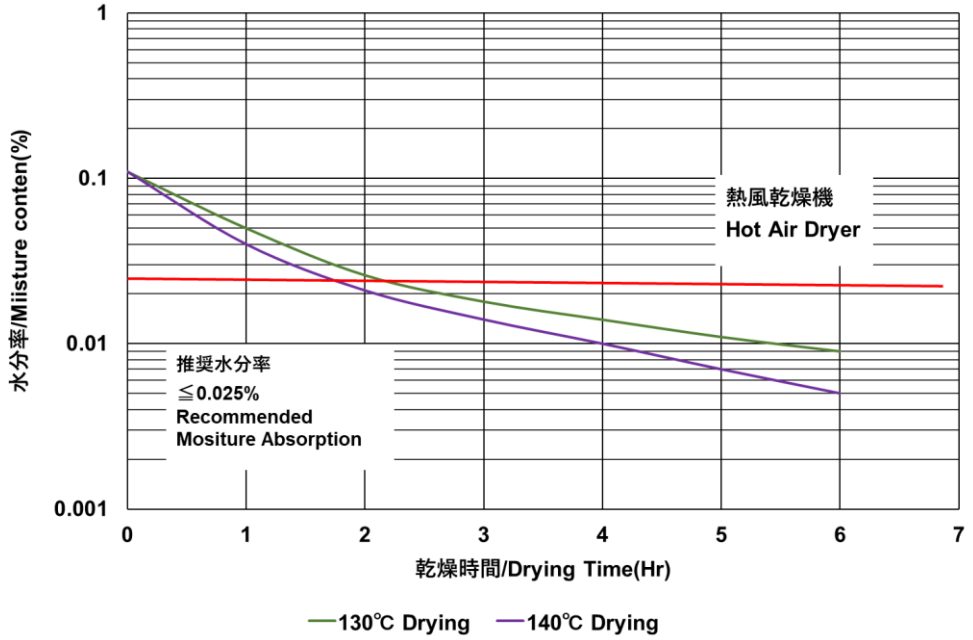
A small amount of moisture could be the cause for not only bubble release, leak from the cylinder nozzle, and bad surface appearance but also deterioration of properties due to hydrolysis of the thermoplastic polyester material. The pre-drying process is important for molding stability and to ensure good quality. Additionally, material exposed to the air for more than 30minutes must be dried.

Pre-drying Conditions

Resin temperature	Drying time
130℃	4～6h
140℃	3～5h

VYLOPET™ must be dried before molding.
VYLOPET™ should be processed with a moisture content of less than 0.025% (Ideally less than 0.020%).

VYLOPET™ can be dried with either a shelf-type dryer or a hopper type dryer, but a dehumidification dryer is strongly recommended. Recommended drying conditions vary slightly depending on the dryer type and amount of resin to be dried, so please check the pellet temperature. For parts that are particularly susceptible to gassing issues, we recommend reducing the moisture content as much as possible with a longer drying time.



VYLOPET™ Processing Conditions

Molding Condition

Typical Temperature

Typical cylinder temperature settings (except under the hopper) are shown in the table. For flame resistant grades, it is important to set the cylinder temperature as low as possible.

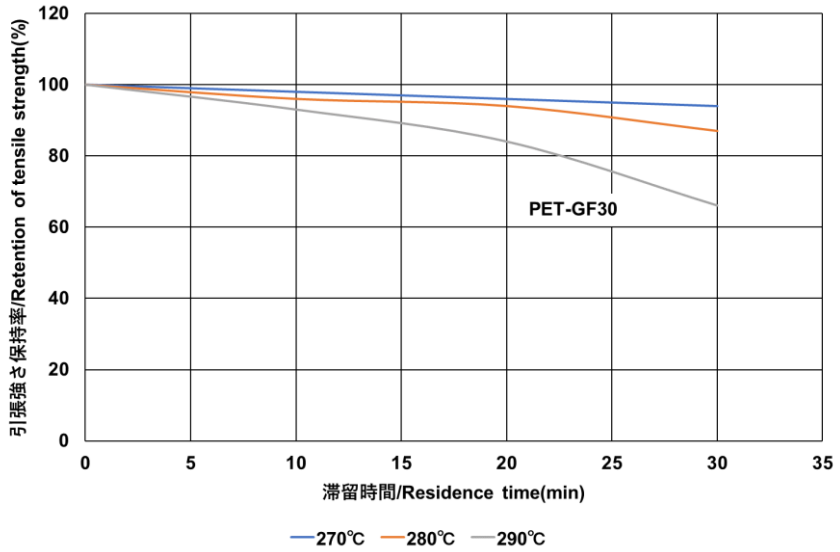
	PET	PBT/PET	PBT
Example Grade	EMC-330	EMC-430X-8	EMC-730
C1	245～265℃	240～260℃	220～250℃
C2	265～285℃	260～280℃	240～270℃
C3	265～285℃	260～280℃	240～270℃
NZ	265～285℃	260～280℃	240～270℃
Mold Temperature	120～140℃	50～100℃※	50～90℃

*Ideal range for appearance parts : 80-120℃

VYLOPET™ Processing Conditions

Residence Time

Long residence time in the cylinder leads to material degradation, deterioration of mechanical properties, changes in flow properties, and discoloration. Residue left in the cylinder should be removed by several shots of purge when the machine is stopped for longer than for 10 minutes.



Mold Temperature

The mold temperature should be set based on consideration of the dimensions of the part, warpage, surface appearance, and cycle time. For PET types, it is generally recommended to set the temperature to 120℃(-135℃) higher.
Molding at 40-70°C is also possible for PET materials, but the second-order shrinkage becomes large.
The general molding temperature of PBT/PET materials is 50-70°C for a typical molded part, though a mold temperature of 80-100°C is recommended for molded parts requiring a good surface appearance.

Injection Speed

An easy way to get a good surface appearance with VYLOPET™ is to set a high injection speed. However, a high injection speed may lead to warpage or burn marks on the surface of the part. Appropriate judgment will be necessary when balancing these concerns to achieve a good surface appearance.

VYLOPET™ Processing Conditions

Mold Design

Mold Material

The typical mold materials for PET are wear-resistant steel alloys.
SKD11 (D2) is the most popular alloy for GF-reinforced material, but SKD-61 and stainless steels like SUS420 or SUS440 are used as well. The hardness of all should optimally be higher than R55 or R60 with HRC after hardening and tempering. SUS310 or SUS440 that have good corrosion resistance are effective for improving mold durability.

Mold Temperature Control

It is normal to use cartridge heaters, hot water, or hot oil to control the mold temperature.
The mold temperature is strongly affects cycle time, surface appearance and quality, therefore it is very important to check the mold temperature distribution, and cooling of the cavity's core.
To maintain a uniform temperature distribution, it is effective to use a heat insulating plate between the mold and the platen.

Runner and Sprue

Fully round or trapezoidal runners are preferred, semi-circular or rectangular runners should be avoided.
Cold slug catchers should be placed at the end of each runner and sprue.

Draft Angle

Though it depends on the mold surface, polish level and mold shrinkage of the material, normally the draft angle should be 0.4-1 degrees.

Venting

VYLOPET™ molds must be vented in order to allow for the air present in the mold to escape when the molten material fills runners and cavities. Inadequate venting can lead to incomplete parts, burn marks, flash, poor surface appearance, or weak welding lines. In addition, well-vented tools will allow for a faster cycle time.
The depth should be at least 0.02-0.05mm, width should be secured as wide as possible. The depth should be 3mm around 0.75mm far from cavities, and lead the vent to the edge of the mold.

VYLOPET™ Processing Conditions

Injection Molding Troubleshooting

Trouble	Cause		Countermeasure
Sink marks	Condition	1. High resin temperature 2. High/low mold temperature 3. Low holding pressure 4. Insufficient holding pressure time 5. Insufficient cooling time 6. No cushion	1. Reduce the cylinder temperature 2. Set the mold temperature accordingly 3. Increase the holding pressure 4. Increase the holding pressure time 5. Increase the cooling time 6. Make cushion 5-10mm
	Design	1. Small runner/ gate 2. Unsuitable gate location	1. Enlarge the runner/gate size 2. Relocate the gate to a thicker area
	Machine	1. Back-flow during injection	1. Inspect or exchange the backflow valve
Warpage, Deformation	Condition	1. Unsuitable injection conditions 2. Insufficient holding pressure time 3. Insufficient Cooling time 4. Temperature difference between cavity and core	1. Increase the injection pressure/speed 2. Increase the holding pressure 3. Increase the cooling time 4. Control the temperature of cavity and core separately
	Mold	1. Unsuitable ejector pin placement 2. Insufficient ejector pin size	1. Balance ejector pin placement 2. Enlarge ejector pin size 3. Increase the draft angle
	Design	1. Unsuitable gate location 2. Extreme change in part thickness 3. Not enough gates for the part size	1. Change gate location 2. Even out the part thickness 3. Increase the number of gates
Flash	Condition	1. High resin temperature 2. High injection speed 3. High holding pressure 4. Low mold clamping force 5. Filling resin Volume is too high	1. Reduce the resin temperature 2. Reduce the injection speed 3. Reduce the holding pressure 4. Increase the mold clamping force 5. Set the cushion about 5mm
	Mold	1. Mold surface doesn't mate properly	1. Modify the mold
Burn marks	Condition	1. High resin temperature 2. Air entrapment 3. High injection speed 4. Filling resin volume is too high	1. Reduce the resin temperature 2. Reduce the screw rotation 3. Reduce the injection speed 4. Decrease the residence time
	Mold	1. Inadequate venting	1. Increase gas ventilation
	Design	1. Unsuitable gate location 2. Small gate size	1. Change the gate location to make the welding line on the PL 2. Enlarge the gate size
Welding line	Condition	1. Low resin temperature 2. Low mold temperature 3. Low injection speed	1. Increase the cylinder temperature 2. Increase the mold temperature 3. Increase the injection speed
	Mold	1. Inadequate holding pressure	1. Increase gas venting and/or change gate location to move the weld line onto the parting line.
Poor surface appearance	Condition	1. Low resin temperature 2. Low mold temperature 3. Low injection speed 4. Inadequate holding pressure 5. Insufficient amount of resin for fill	1. Increase the cylinder temperature 2. Increase the mold temperature 3. Increase the injection speed 4. Increase the holding pressure/time 5. Make cushion 5-10mm
	Mold	1. Inadequate holding pressure 2. Unclean mold	1. Increase the holding pressure/time 2. Clean the mold

Processing

Safety

Molding Operation

- When purged resin contains a large quantity of gas or steam, the resin may have been insufficiently dried. We recommend re-drying the resin.
- Resin held in the cylinder for an extended period of time may lose viscosity or experience other impacts on quality. Please resume molding only after thoroughly replacing the resin that has been held too long in the cylinder with new resin.
- When switching from VYLOPET™ to another polymer, replace the VYLOPET™ with polyethylene or polypropylene to purge. Local and general ventilation are recommended.
- Keep hands and face away from the nozzle during molding to prevent burn injury.
- Please ensure proper ventilation, as a small amount of gas and fine dust may be produced during molding.

Protective equipment

- Wear appropriate protective equipment such as protective clothing, safety glasses, and gloves to protect eyes and skin from the molten resin.

Emergency Response

- Should molten resin adhere to the skin, cool the area immediately with cold water or an ice pack and then seek medical attention. Do not attempt to peel the resin off of the skin.

Other

- Do not let molten resin touch electric wires or hoses.
- Molten resin reaches high temperatures and can catch fire if it forms large clumps when purging. Break up large clumps and allow to cool before disposal.
- Spilled pellets can be a slipping hazard, so be sure to clean them off the floor immediately.

Notes

Disclaimer

- All of the property data is based on natural color or general black. Data may vary depending on color.
- All information in this technical data sheet is based on the experiences of TOYOBO MC Corporation.
- These information may vary depending on mold condition and application.
- There may also be laws and regulations depending on intended use. Please be careful of this things when using this product.
- If this material is to be used for medical, military, or food contact applications, or if it is to be used in a product where a defect in the product is likely to result in death, bodily harm, or substantial property damage, please contact us separately beforehand.
- Export of our materials and products using our materials must comply with the Foreign Exchange and Foreign Trade Law and other relevant laws and regulations.
- Chemical substances used in this material may be regulated by laws and regulations related to chemical substances in each country, and separate applications may be required or import/export may not be allowed. If you are an importer or exporter of this material, please inquire about compliance with regulations in the relevant country.
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