Teijin's Materials for Pharmaceutical Container

Unlocking Infinite Potential in Healthcare

TEIJIN LIMITED. Resin & Plastic Processing Business Unit

Introduction

- Teijin has developed a number of resin businesses centered on the polycarbonate resin Panlite®, first commercialized by Teijin in Japan in 1960. Teijin has been researching and developing in the medical field for over 30 years.
- Based on the Company's pioneering spirit of making the impossible possible, Teijin provides solutions that support advanced medical care to meet the needs of its customers.

Wish to safe your devices from all disinfectants
Chemical resistance

Wish to use environment friendly materials
Halogen free flame resistant UL94 V-0

Wish to use safer materials
Biocompatibility (ISO 10993)

Wish to use safe and secure materials
Long term reliability

Wish to replace glass bottles with resin bottles
Airtightness

Wish to use materials that can withstand sterilization
Gamma-ray/ electron-beam sterilization

SUSTAINABLE DEVELOPMENT GOALS

PEN transparent grade

TEIJIN

■ Polyethylene naphthalate (PEN) resin:

- PEN resin is a material that excels in chemical resistance, gas barrier performance, and low absorptiveness.

	Transparency	Heat-resistant	Chemical resistant	Gas barrier performance	Low absorptiveness
PEN	○	○	◎	◎	◎
PC	○	○	△	△	△
PET	○	△	△	○	△
COC※	◎	○	△	△	△
PEI※	△	◎	○	△	△

※COC : Cyclic olefin copolymer, PEI : Polyetherimide

PEN transparent grade

Features

Products of this category excel in chemical resistance, airtightness, and low absorptiveness and can be used for containers storing a wide range of chemicals.

・ Since the standard grade could not support autoclave sterilization, the heat resistant grade was developed.

Type	Grade	Heat deflection temperature※	Yellow
Standard grade	TN-8065S	**107**	Light

※HDT Measurement condition : 0.45MPa

PEN grade Physical properties

Property	Unit	Standard	Measurement condition	PEN resin General Grade TN-8065S	COC	PEI
Density	kg/m^3	ISO1183	-	**1,330**	1,000	1,270
MVR	cm^3/10min.	ISO1133	300℃、2.16kgf	**15**	-	-
Tensile strength	MPa	ISO527-1 ISO527-2	50mm/min.	**80**	60	105
Tensile strain at break	%			**50**	3	60
Flexural strength	MPa	ISO178	2㎜/min.	**98**	99	160
Flexural modulus	MPa			**2,200**	2,480	3,300
Charpy impact strength	kJ/m^2	ISO179	notched	**3**	3	-
	kJ/m^2		unnotched	**NB**	39	-
Heat deflection temperature	℃	ISO75-1 ISO75-2	1.8MPa	**92**	139	190
			0.45MPa	**107**	152	200
Water vapor permeability coefficient	g・mm/(m^2・24hr)	JIS	40℃、90%RH	**0.3**	0.1	-
Oxygen permeability coefficient	cm^3・mm/(m^2・day.MPa)	K7126-1	23℃、50%RH	**12**	200	2,000
Rate of dimensional change	%	In house method	132℃、0.4hr	**5**	0	0

※ The values shown in the figure are representative values but not guaranteed values.

Molding Condition

Item	Unit	PC Transparent Grade	PEN General Grade
			TN-8065S
Molding temperature	℃	280~330	280~310
Mold temperature	℃	70~120	40~90
Injection molding pressure	MPa	98~147	60~140
Drying temperature	℃	120	140~160
Drying time	h	5~8	5~8
Temperature inside hopper	℃	120	100~120

※ For PEN grade products, dehumidifying type dryers are recommended.

Molding condition & Caution

(1) **Pre-drying**
For drying conditions, when a box type hot air dryer is used, make the pellet layer 3 cm or less, and refer to the table on the next page for the drying temperature and conditions. As shown in the following table, heat the hopper to keep pellets hot and prevent moisture absorption. If drying is not sufficient, resin deterioration occurs because of hydrolysis and thermolysis during the molding process. Conduct pre-drying sufficiently. When dying is performed by using a hopper dryer, a hopper dryer with a capacity big enough to perform molding for four hours or more is appropriate, and for the temperature inside the hopper, refer to the table on the next page.

(2) **Injection molding**
Select an injection molding machine whose injection capacity is 1.5 to 3 times as big as the weight of a molded item; for the cylinder temperature, die temperature, and injection pressure, consider that the ranges shown in the table on the next page are appropriate. If the resin temperature exceeds the molding temperature range, resin deterioration occurs and leads to the causes of poor appearance and degradation of physical properties. Be careful. In addition, for a back pressure, apply approx. 10–20 MPa and make air inclusion as little as possible.
Set the screw rotating speed as low as possible, and ensure that measurement is completed two to three seconds before the time of cooling completion.
Resin accumulation inside the cylinder causes poor appearance and degradation of physical properties. To pause or stop the molding machine for a long period of time, lower the cylinder temperature to a level near 150℃, and then perform purging before restarting the molding machine to remove the accumulated resin completely.

CAUTION

- The figures listed in this technical data are typical values obtained under standard test methods, and may not be applicable for products that are used under different application conditions.
- The combustion figures listed in this technical data are from small-scale test and may not be applicable for hazards during a major fire.
- Please refer to us for an advice regarding the application conditions for medical equipment, food service applications, and toys.
- When any kind of additives (such as anti-bacterial agents, stabilizers and flame retardants) or coloring agents are to be added to this resin, please be sure to consult with TEIJIN LIMITED, in advance.
  However, even after consultation, TEIJIN LIMITED will not guarantee nor bear responsibility in any form for usage of such additives.
- Please carefully consider all potential industrial property rights when considering applications introduced in this technical data.
- The contents of this technical data may be changed without prior notice.
- Please refer to the Safety Data Sheet (SDS) before use for other warnings in detail.