

PVC free solution with Zelas™

Mitsubishi Chemical Corporation
Advanced Films and Polymers
Performance Polymers Division



PVC
FREE



BPA
FREE



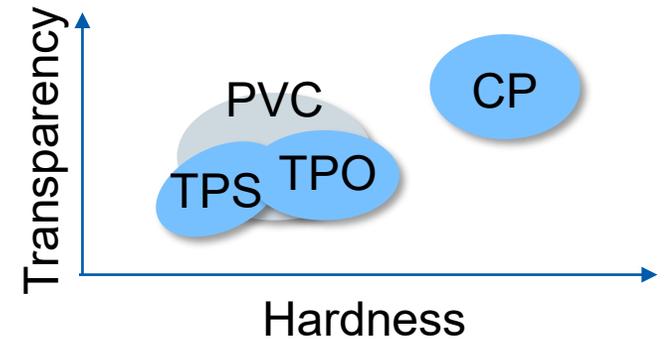
What is Zelas™??

Polymer compound designed for medical and pharmaceutical application.

There are 3 types in Zelas™-TPS, TPO and CP. Zelas™ has been existing in the market for over 30 years by offering a wide variety of solutions to medical/pharmaceutical industries.

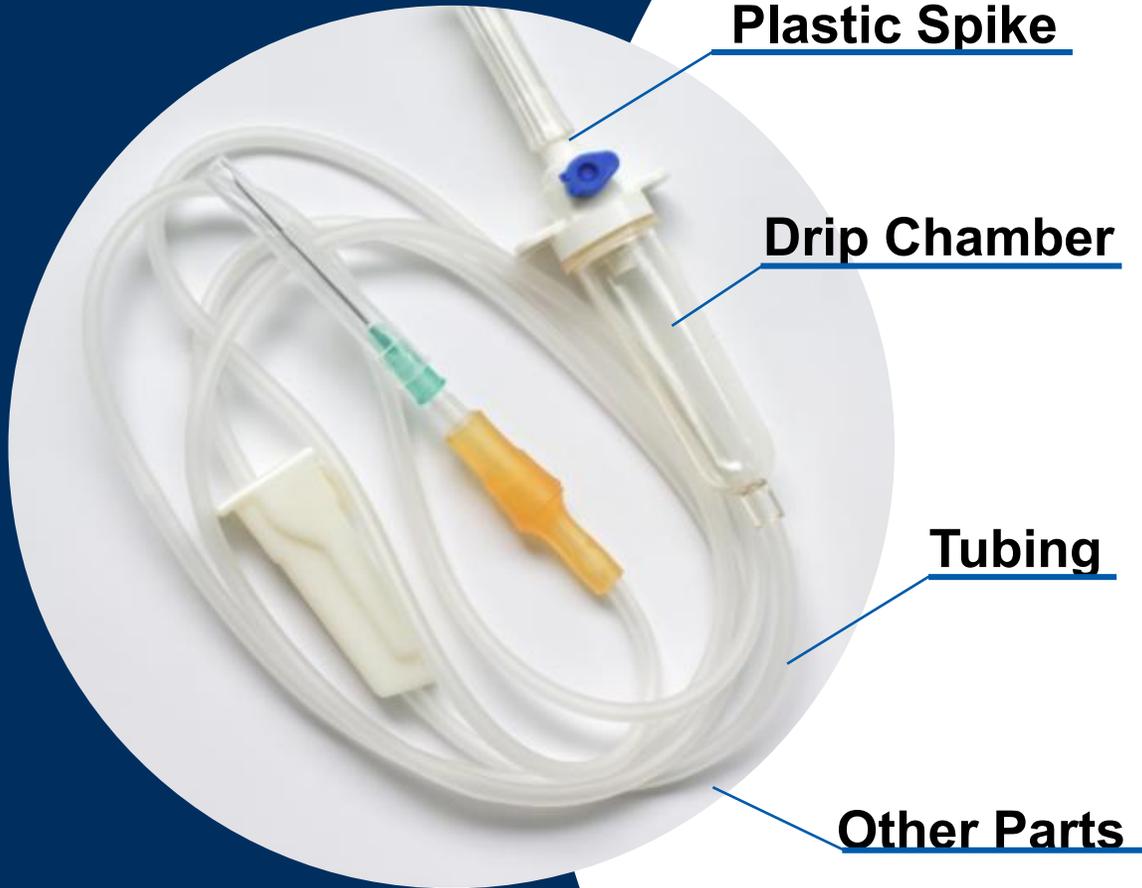
Basic Concept

1. Using qualified raw materials
2. Production in controlled compound lines (ISO-9001)
3. Knowledge with various medical regulation/standard
(Pharmacopoeia (JP, US), Biocompatibility, DMF etc)
4. Change Control (Prior notification with ensuring stock for validation)



	Zelas™	PVC
Plasticizer	 Plasticizer free	
Drug adsorption	 Low adsorption	
Flexibility	 Comparable to PVC	
Transparency	 Comparable to PVC	
Heat resistance Autoclave sterilization	 Decomposition temperature $\geq 240^{\circ}\text{C}$	 Decomposition temperature $\approx 140^{\circ}\text{C}$
Material weight	 Density $\approx 0.9\text{g/cm}^3$	 Density 1.2~1.4g/cm ³

Our proposal for IV set



Current material

ABS, PC, PP

PVC, TPO(Japan)

PVC, PB(Japan)

PVC, PC

Recommended material

PP

Zelas™ MCseries (TPO)

Zelas™ MPseries(TPS)

PP, **Zelas™ MCseries (TPO)**



We can offer **Zelas™ grades** as our product.

Our proposal for bag application



PVC bag
(Polar Resin)

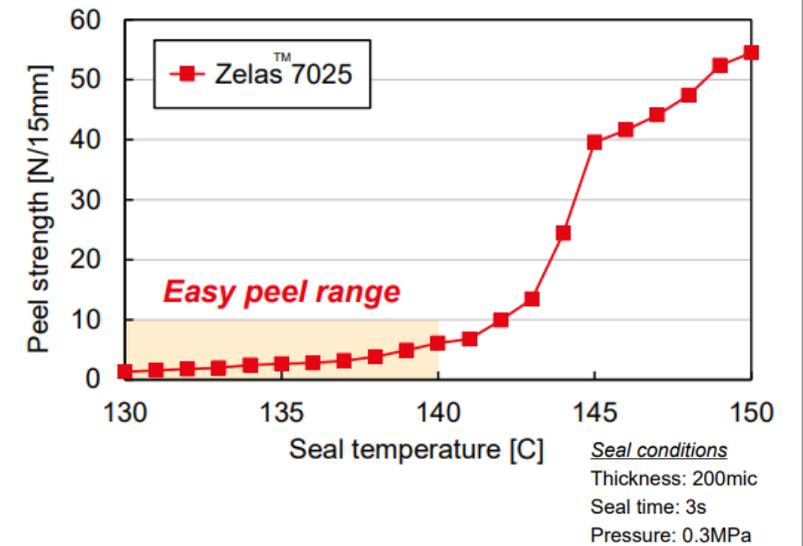
➤➤➤ **Zelas™ TPO** (MCseries)
(Nonpolar Resin)

Sealing Process

High Frequency → **Heat seal**

Technical point

✓ Controllable peel strength. ...Double chamber bag



Our proposal for tubing application



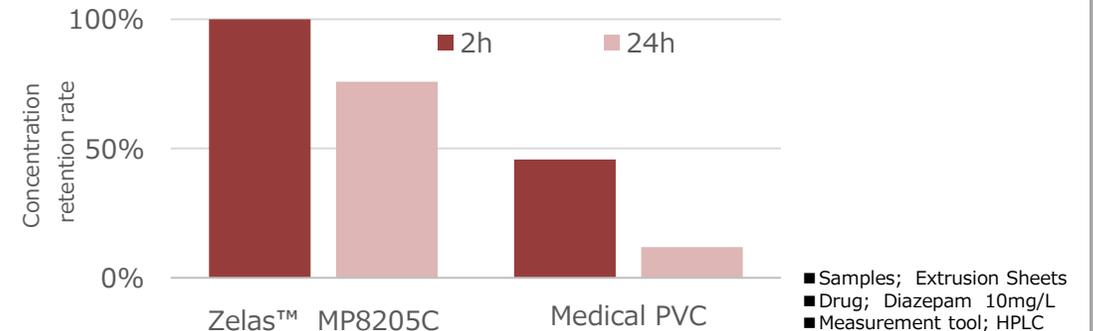
PVC tubing >>> **Zelas™ TPS (MPseries)**

Technical point

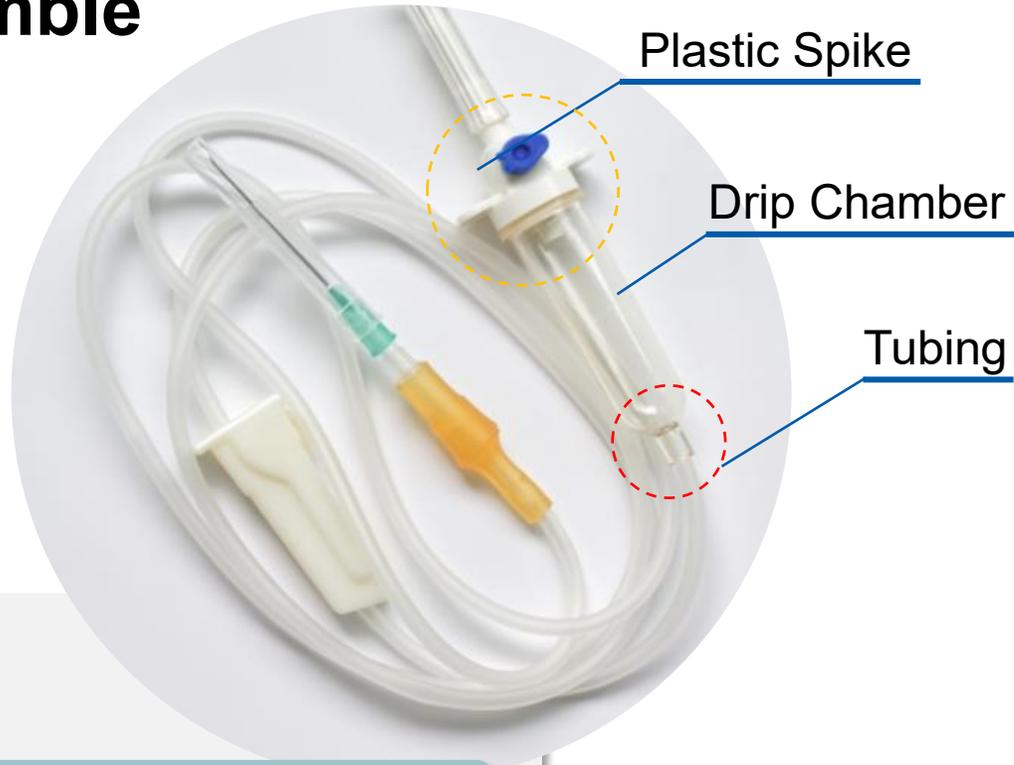
✓ Chemicals incompatible with PVC.

Category	Name	Problem
Anti-anxiety drugs	Diazepam	Sorption to DEHP
Sedative	Midazolam	Sorption to TOTM
Antianginal drugs	Nitroglycerin	Sorption to DEHP
Vasodilator	Isosorbide dinitrate	Sorption to DEHP

✓ Low sorption of Diazepam.



How to assemble



PVC



Adhesive bonding



High Frequency welding



Zelas™



Adhesive bonding

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Ultrasonic welding

...p.9



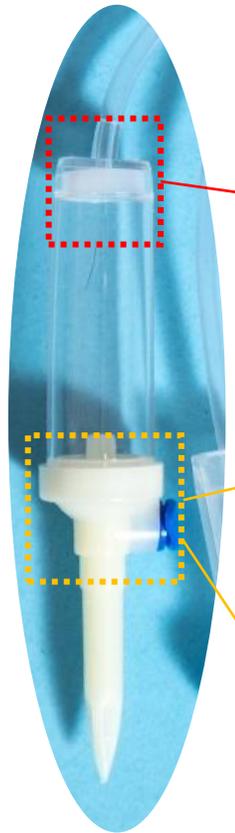
Laser welding

...p.10



Adhesive bonding

Glue testing supported by ThreeBond Co.,Ltd.



	Without Primer Strength (MPa)	With Primer Strength (MPa)	Test Condition
Tube (Zelas™ TPS*1) + Drip Chamber (Zelas™ TPO*2)	0.29	0.54*3	Glue : TB1771M (Instant & UV type) Primer : TB7797 <Test Method> Tensile lap-shear strength test: 3TS-4100-013 Adhesive area: 25 × 10mm <Curing Condition> Without Primer : Glue→24°C55% × 24h With Primer : Primer→30sec.→Glue→24°C55% × 24h <Machine> UV-LED device: JUL-M-433AN-05 (JATEC) Universal tester: OAF-08 (ORIENTEC Co., Ltd.)
Drip Chamber (Zelas™ TPO*2) + Plastic Spike (ABS)	0.65*4	0.61*4	
Drip Chamber (Zelas™ TPO*2) + Plastic Spike (PP)	0.15	0.59*4	

*1 Zelas™ MP8202C *2 Zelas™ MC123 *3 Zelas™ TPS Material Failure(MF). *4 Zelas™ TPO Material Failure(MF).

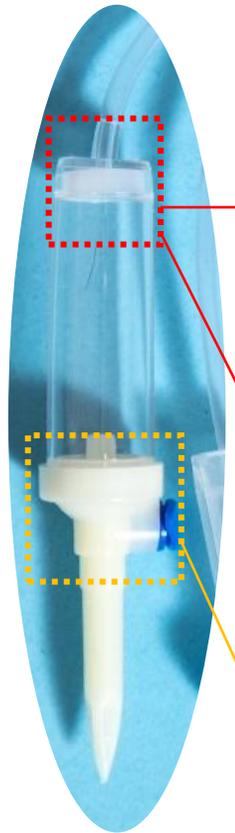
Data shown above are the representative values, not the guaranteed values.

For more detailed information about the glue, please contact ThreeBond Co.,Ltd. <https://www.threebond.co.jp/en/inquiry/>



Ultrasonic welding

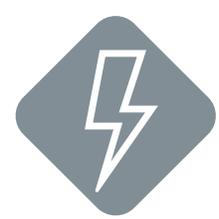
Ultrasonic testing supported by Herrmann Ultrasonic Japan



	Strength (MPa)	Test Condition
Tube (Zelas™ TPS*1) + Drip Chamber (Zelas™ TPO*2)	0.3	<Ultrasonics Machine> Ultrasonics HiQ DIALOG SpeedControl (20kHz) Welding area ≒200mm ² <Test Method> Machine: AG2000 Tensile speed : 50 mm/min
Tube (Zelas™ TPS*3) + Drip Chamber (Zelas™ TPO*2)	0.3	
Drip Chamber (Zelas™ TPO*2) + Plastic Spike (PP)	2.5*4	

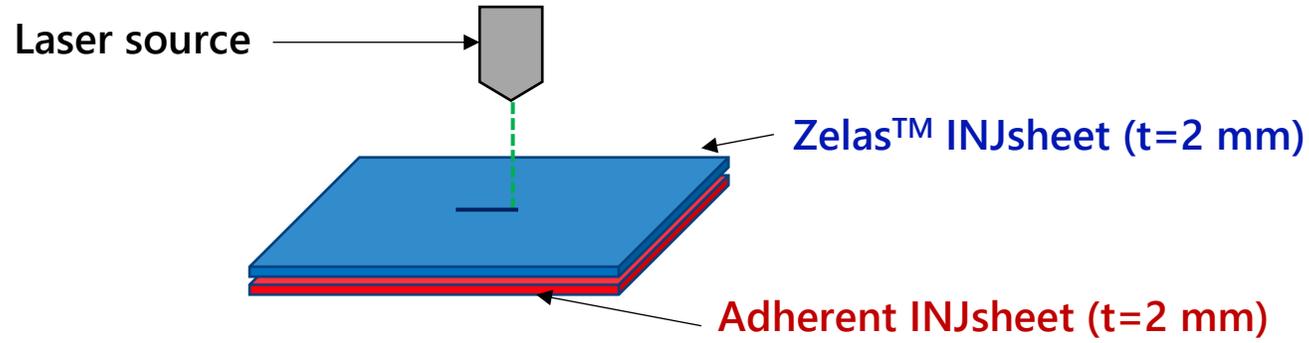
*1 Zelas™ MP7202C *2 Zelas™ MC111 *3 Zelas™ MP6301C-2 *4 PP Material Failure(MF).

Data shown above are the representative values, not the guaranteed values.



Laser welding

2μm Laser testing supported by Marubun Corporation



Adherent	Zelas™ TPS*1
Zelas™ TPS	○
PP	○
PE	○

<Machine>
 Optical Engines PE2000-2UM
 Wavelength : 1940nm

*1 Zelas™ MP6201C

Data shown above are the representative values, not the guaranteed values.

For more detailed information about the ultrasonic welding, please contact Marubun Corporation.

Technical Data of Zelas™



Item	Method	Zelas™ TPO	Zelas™ TPS	
		MC111	MP6201C	MP7202C
MFR(230°C, 21N)	Refer to ISO 1133	44	3	2
Density	Refer to ISO 1183	0.89	0.89	0.89
Flexural Modulus	Refer to ISO 178	550	-	-
Hardness (DurometerA)	Refer to ISO 7619	-	56	68
Tensile Stress at Break	Refer to ISO 527	28	-	-
Nominal Tensile Strain at Break	Refer to ISO 527	830	-	-
Tensile Strength at Break	Refer to ISO 37	-	17	15
Elongation at Break	Refer to ISO 37	-	940	880
Haze (2mmt)	Refer to ISO 14782	20	43	-
Example of Sterilization*1		Autoclave, EOG	EOG	Autoclave, EOG
Example of Application		Drip Chamber	Tubing	Tubing
Feature		High transparent	Flexibility	Heat resistance

Data shown above are the representative values, not the guaranteed values.

The product name on the packaging bag, delivery note, SDS, etc. for this product is "Zelas™"

It is the customer's sole responsibility to evaluate and determine the suitability, safety, and legality of the product for its intended use.

MCC reserves the right to make any changes to information or advice at any time, without prior or subsequent notice.

*1 The suitability of sterilization for each product must be determined by customer's responsibility.