



# MEDICAL SOLUTIONS

STRINGENT QUALITY STANDARDS  
AND OUTSTANDING PERFORMANCE



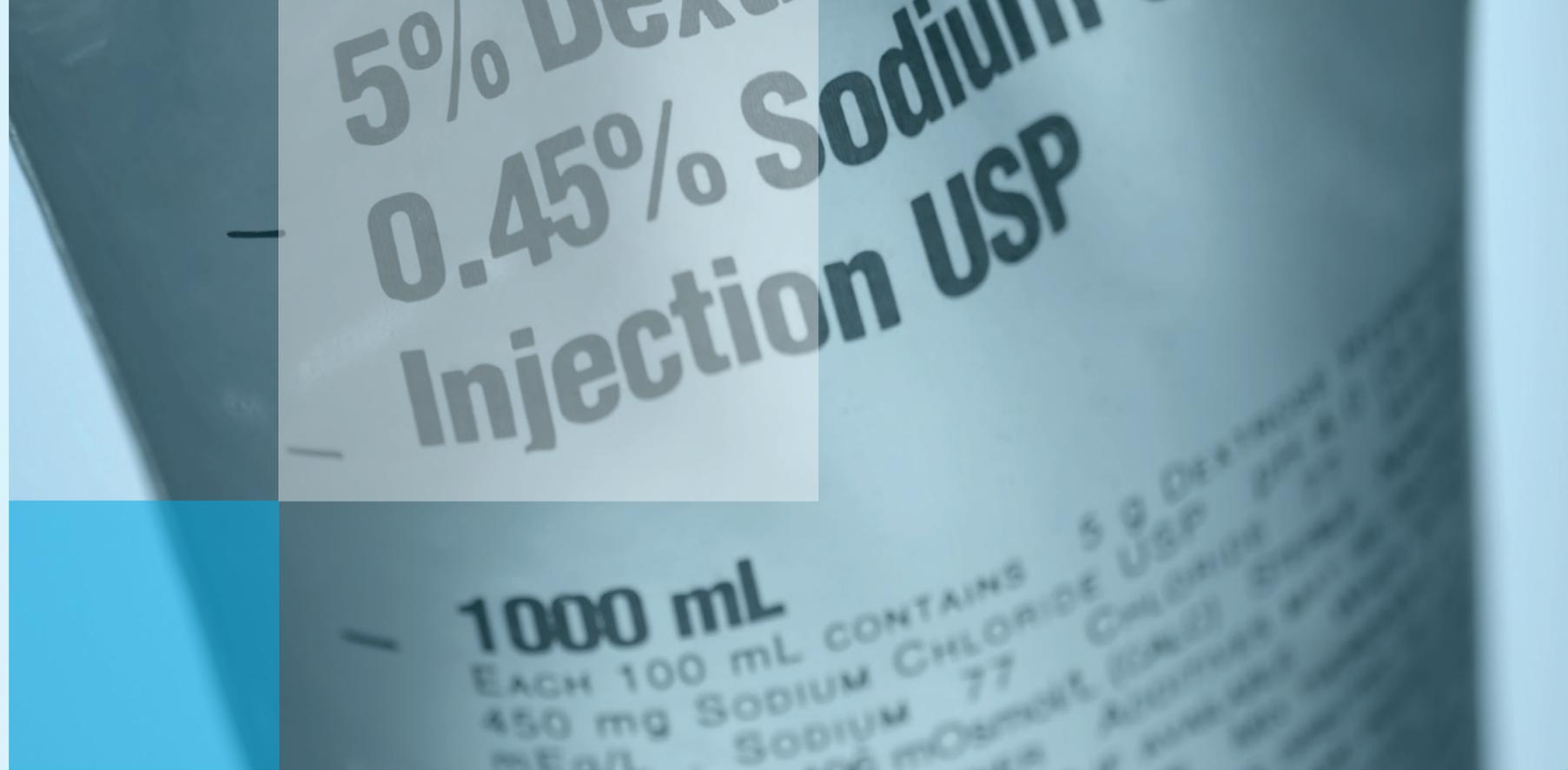
TSRC CORPORATION



# MEDICAL SOLUTION

TSRC focuses on the development of new polymer technology platforms and applications, including high-end hydrogenated styrenic block polymer (HSBC) novel technology platforms, the development of medical SEBS products and technologies, among others. The US Food and Drug Administration (FDA) believes that SEBS materials are non-toxic, non-allergenic, non-mutagenic, and do not react with human tissues. They present good performance across aspects of sealing, temperature stability, and anti-aging, and can also be directly sterilized by autoclave, gamma radiation and EO. Such qualities make it a suitable material for medical device applications such as IV bags, IV tubing, surgical drapes, resuscitators, tourniquets, etc.

TSRC series products can meet market needs for medical applications. Among its key features as compared with traditional materials, TSRC series products do not contain any plasticizers and provide excellent mechanical properties, high transparency, and excellent polyolefin compatibility. Its qualities allow it to meet the stringent quality control requirements of medical applications.



# ABOUT TSRC

For over 50 years, TSRC has been dedicated to providing Styrenic Block Copolymer (SBC) solutions. Widely applied in adhesives, hygiene materials, medical packaging materials, and automotive applications. TSRC collaborates closely with customers to create products that are safer, healthier, more sustainable, and eco-friendly.

# TSRC GLOBAL PRESENCE

■ Headquarters ■ Production Site ■ Sales Office ■ Technology Center

▶ TSRC (Lux.) CORPORATION S.à r.l. (LUXEMBOURG)

▶ TSRC SPECIALTY MATERIALS LLC, PLAQUEMINE, LA (SIS/SBS)

▶ TSRC SPECIALTY MATERIALS LLC, HOUSTON

▶ INDIAN SYNTHETIC RUBBER PRIVATE (ESBR)

▶ THAI SYNTHETIC RUBBERS COMPANY (BR)

▶ POLYBUS CORP., SINGAPORE

▶ SHEN HUA CHEMICAL INDUSTRIAL (ESBR)  
 ▶ TSRC (NANTONG) INDUSTRIES (SEBS, SIS) – MEDICAL SEBS  
 ▶ TSRC – UBE (NANTONG) CHEMICAL INDUSTRIES (BR)  
 ▶ ARLANXEO – TSRC (NANTONG) CHEMICAL INDUSTRIAL (NBR)  
 ▶ NANTONG QIX STORAGE CO.

▶ TSRC (SHANGHAI) INDUSTRIES (APPLIED MATERIALS)  
 – MEDICAL SOLUTIONS

▶ TSRC GLOBAL APPLICATION RESEARCH CENTER (SHANGHAI)  
 – MEDICAL APPLICATION DEVELOPMENT

▶ TAIPEI, TWN

▶ KAOHSIUNG, TWN (HQ)(ESBR, BR, SSB, SEBS, SBS, APPLIED MATERIALS)  
 ▶ TSRC GLOBAL APPLICATION RESEARCH CENTER (KAOHSIUNG)  
 – MEDICAL APPLICATION DEVELOPMENT

# VECTOR<sup>®</sup> FOR MEDICAL APPLICATIONS

VECTOR SEBS is designed for medical applications as alternative to PVC due to its eco-friendliness. VECTOR SEBS passed ISO 10993-5 cytotoxicity testing, USP Class VI testing, complies with medical GMP production, and is well-suited for general modification of articles in medical applications.

## MEDICAL SOLUTIONS

VECTOR  
8101, 8103, 8104



PP CLOSURES  
PP PORTS



IV BAGS  
FILM

VECTOR  
8014D, 8245D

VECTOR<sup>®</sup>  
SEBS

IV STOPPERS  
& LINER



IV TUBING



VECTOR  
8101, 8104, 8109

VECTOR  
8245D

# SEBS GRADES

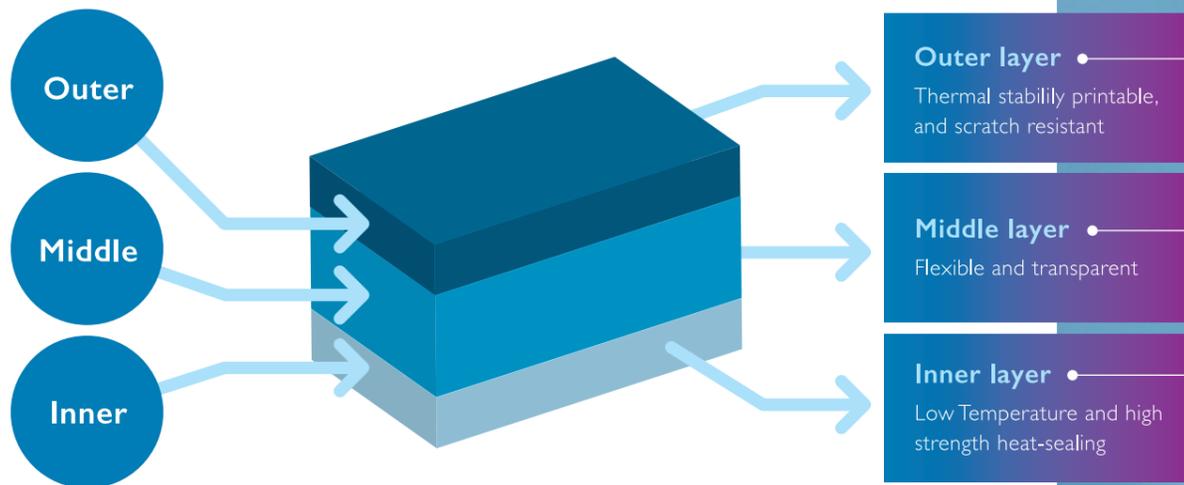
BRAND	TAIPOL												VECTOR					
Type	Regular						High Flow			Functional Grafted			Regular Medical				High Flow Medical	
Grades	6150	6151	6152	6153	6154	6159	6240	6014	6052	6245	7126	7131	8101	8103	8104	8109	8014D	8245D
Polymer Structure	Linear	Linear	Linear	Linear	Linear	Linear	Linear	Linear	Linear	Linear	MA-grafted	MA-grafted	Linear	Linear	Linear	Linear	Linear	Linear
Styrene, wt%	29	32.5	29	29	32.5	29.5	32	18	23	13	29	29	32.5	29	32.5	29.5	18	13
Di-block, wt%	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Melt Flow Rate g/10 min, 200°C/5kg *g/10 min, 200°C/10kg	-	-	4	-	-	-	-	5	40	3.5	20*	10*	-	-	-	-	5	3.5
Solution Viscosity cps 5wt% in Toluene; 25°C *15wt% in Toluene; 25°C **25wt% in Toluene; 25°C	1450**	1700*	440**	2500**	280**	320	1500**	-	230**	-	-	-	1700**	2000**	280*	320	-	-
Specific Gravity	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.96	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Tensile Strength psi	3900	-	4200	3900	-	-	-	2300	1400	1400	-	-	-	3900	-	-	2300	1400
(MPa)	(27)	-	(29)	(27)	-	-	-	(16)	(10)	(10)	-	-	-	(27)	-	-	(16)	(10)
Elongation at Break %	500	-	500	500	-	-	-	500	500	1000	-	-	-	500	-	-	500	1000
Hardness, Shore A	76	-	76	76	-	-	-	70	75	40	73	75	-	76	-	-	70	40
Product Form	Powder	Powder	Porous Pellet/ Powder	Powder	Powder	Powder	Powder	Porous Pellet	Porous Pellet/ Powder	Porous Pellet	Dense Pellet	Dense Pellet	Powder	Powder	Powder	Powder	Dense Pellet	Dense Pellet

# IV BAG/FILM

## 3-LAYER CO-EXTRUDED IV BAG FILM

Improved Clarity & Flexibility in IV Bags with VECTOR 8245D

LAYER	COMPOSITION	THICKNESS (UM)		
		180	200	240
Outer	90% PP+ 10% SEBS	20	20	30
Middle	70% PP+ 30% SEBS	140	160	180
Inner	90% PP+ 10% SEBS	20	20	30



3-LAYER FILM			THICKNESS (UM)		
			180	200	240
Physical Properties	Yield Strength (MD / TD)	MPa	34 / 34	33 / 34	34 / 35
	Yield Elongation (MD / TD)	%	1030 / 1080	1050 / 1050	1136 / 1075
	Young's Modulus (MD / TD)	MPa	1.2 / 1.3	1.2 / 1.3	1.2 / 1.3
	M300 (MD / TD)	MPa	12 / 13	12 / 13	12 / 13
	Heat Sealing Strength (160°C)	N/15mm	30	30	35
Optical Properties	Transmittance	%	96	95	95
	Haze	%	4	5	5
	Yellow Index (YI)	-	3.1	3.5	3.8
Penetrate Properties	Water Vapor Transmission (WVTR)	g/m <sup>2</sup> day	3.6	3	2.6
	Oxygen Transmission (OTR)	cc/m <sup>2</sup> day	180	137	129

# IV SEALING COMPONENTS

## FEATURES

- ▶ Zero Fragment
- ▶ Static Spike-retention
- ▶ No Leakage
- ▶ Well Self-sealing
- ▶ Suitable for Co-injection Process
- ▶ Achieve 48pcs Per Injection

## DEVELOPMENT OF MEDICAL SEALING COMPONENT MATERIALS





## ASSEMBLED PP CAP

OUTER CAP + INNER CAP + SEBS ELASTOMER

Internal Tests Passed Piercing, Particle Shedding, and Leakage Tests

Certified by ISO 10993-5 Cytotoxicity Test

Isoprene Rubber Can be Replaced by TSRC SEBS Formulated Material

## CO-INJECTION CAP

CO-INJECTION MOLDING (PP + SEBS ELASTOMER)

TSRC SEBS Formulated Material Co-injection with PP

External Tests Passed Piercing, Particle Shedding, Self-sealing, and Retention Force (Dynamic & Static)

Certified by ISO 15759

Certified by ISO 10993-5 Cytotoxicity Test

Compliance with Integrated Container Closure System Guidelines



### PHARMACEUTICAL PACKAGING MATERIALS (YBB STANDARD)

TEST ITEM	METHOD	SPECIFICATION	TSRC TEST RESULT
PIERCING RESIDUE	YBB 00232004-2015: Pharmaceutical Synthetic Isoprene Rubber Stopper	<20 Pcs	●
PENETRATION FORCE		<75 N	●
SELF-SEALING		No leak out	●
NEEDLE RETENTION		No pull out	●
ASH CONTENT	-	<25%	●

### PHARMACEUTICAL PACKAGING MATERIALS (CERTIFICATION)

TEST ITEM	METHOD	SPECIFICATION	TSRC TEST RESULT
PIERCING RESIDUE	Plastic and Metal Spike	<10 Pcs	●
PENETRATION FORCE	3016-2021 Technical Guide for Co-Injeciton Closure for Intravenous Container	5,2 mm Plastic Spike	<75N
SELF-SEALING		0,8 mm Metal Spike	No leak out
NEEDLE RETENTION (DYNAMIC)	Plastic and Metal Spike	Spike>5N; Metal>1N	●
NEEDLE RETENTION (STATIC)	5,2 mm Plastic Spike	No leak out, No pull out	●

## PHARMACEUTICAL PACKAGING MATERIALS

### Mechanical Properties of Medical Sealing Components

TEST ITEM	METHOD	UNIT	TSRC TEST RESULT
HARDNESS	ASTM D2240	Shore A	35
S.G	ASTM D297	-	0.97
MFI (230°C/5KG)	ASTM D1238	g/10min	14.4
TENSILE STRENGTH	ASTM D412	MPa	4.5
ELONGATION	ASTM D412	%	438
COMPRESSION SET	ASTM D395(70°C)	%	26
ASH CONTENT	TGA	%	10

**STATIC  
SPIKE-RETENTION**  
1 kg/4hr

**WELL RESEALING  
AFTER PULL OUT**  
After 4 hours  
Suspension Test

**WELL  
SELF-SEALING**  
20 kPa

# IV TUBING

## FEATURES

- ▶ Material is easily recyclable and serves as an eco-friendly alternative to PVC, free from environmental hormones.
- ▶ Enhanced heat resistance allows sterilization by high-pressure steam; also suitable for EtO and gamma sterilization.
- ▶ Tubing characteristics: High transparency, excellent flexibility, kink resistance, and high production efficiency.

## IV TUBING

Complies with Medical Regulations

"0" Plasticizers

High Transparency

Suitable for EtO and Gamma Sterilization

### KEY PROPERTIES



Excellent Kink Resistance



Excellent Clamp Resistance



Good Bonding Strength

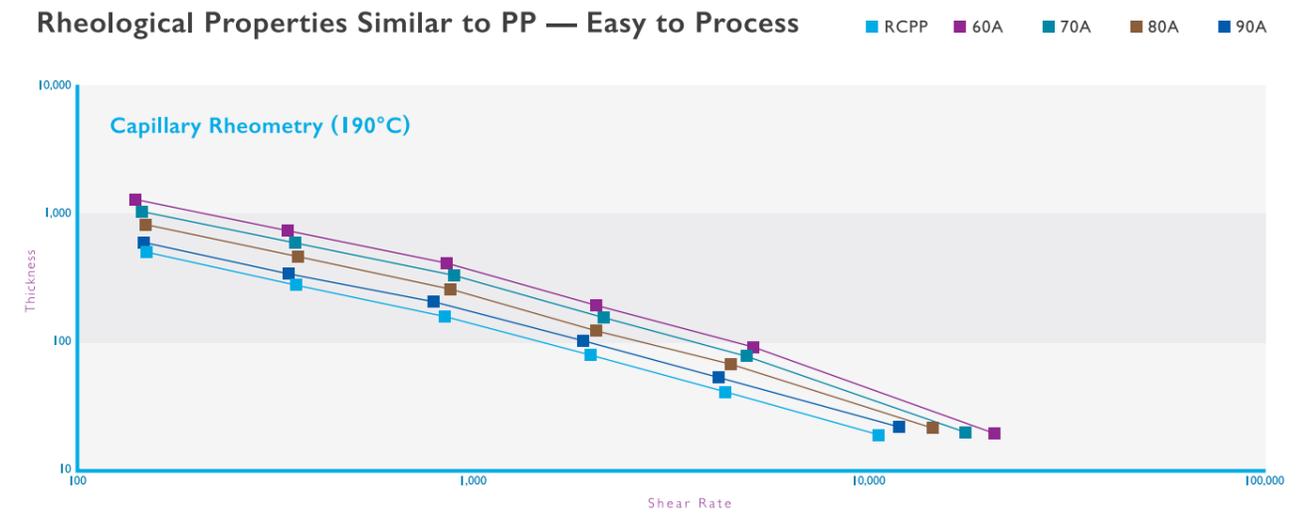


## ADJUSTABLE TUBE HARDNESS TO MEET DIVERSE APPLICATION NEEDS

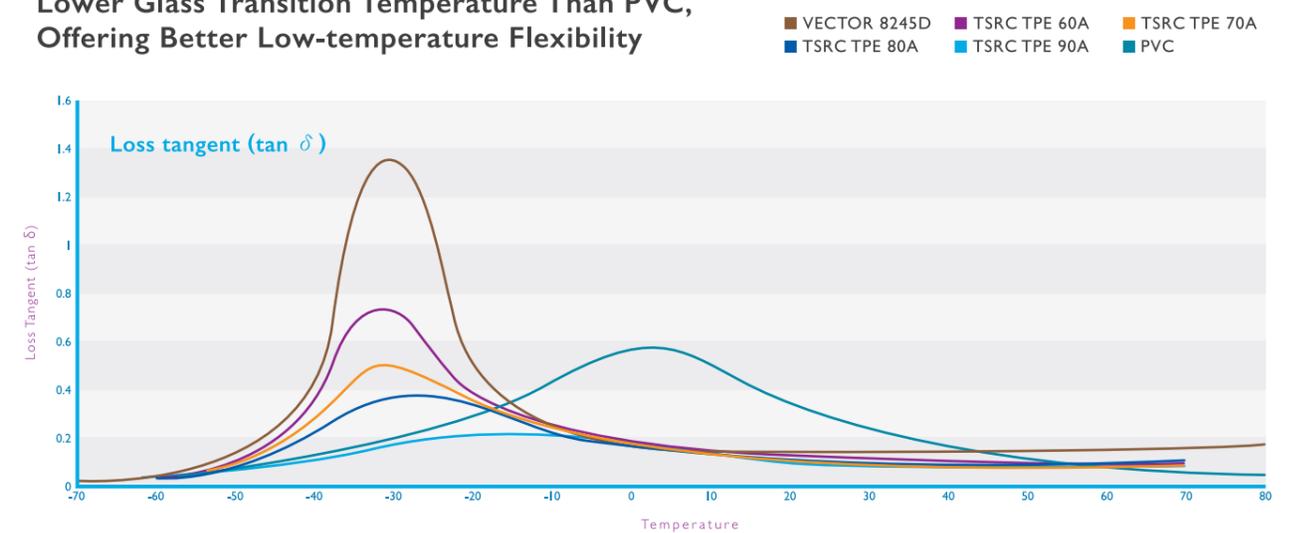
TEST ITEM	UNIT	TSRC SOLUTION				PVC
HARDNESS	Shore A	60	70	80	90	79
PROPORTION		0,89	0,89	0,89	0,89	1,22
MFI (230°C/2.16 KG)	g/10min	4.0	4.6	5.1	6.2	-
TENSILE STRENGTH	Mpa	7.7	11.5	14.2	15.9	15.9
ELONGATION	%	738	560	500	486	357
KINK RESISTANCE	mm	18	21	22	25	19
CLAMP LEAKAGE	sec	1	<1	<1	<1	<1

## DYNAMIC MECHANICAL ANALYSIS

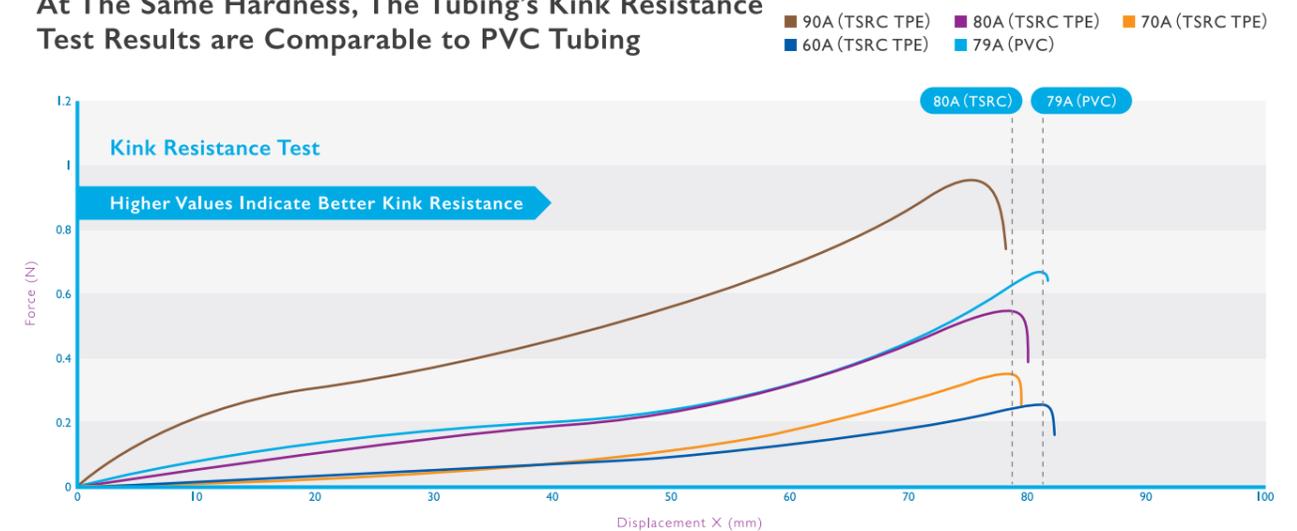
Rheological Properties Similar to PP — Easy to Process



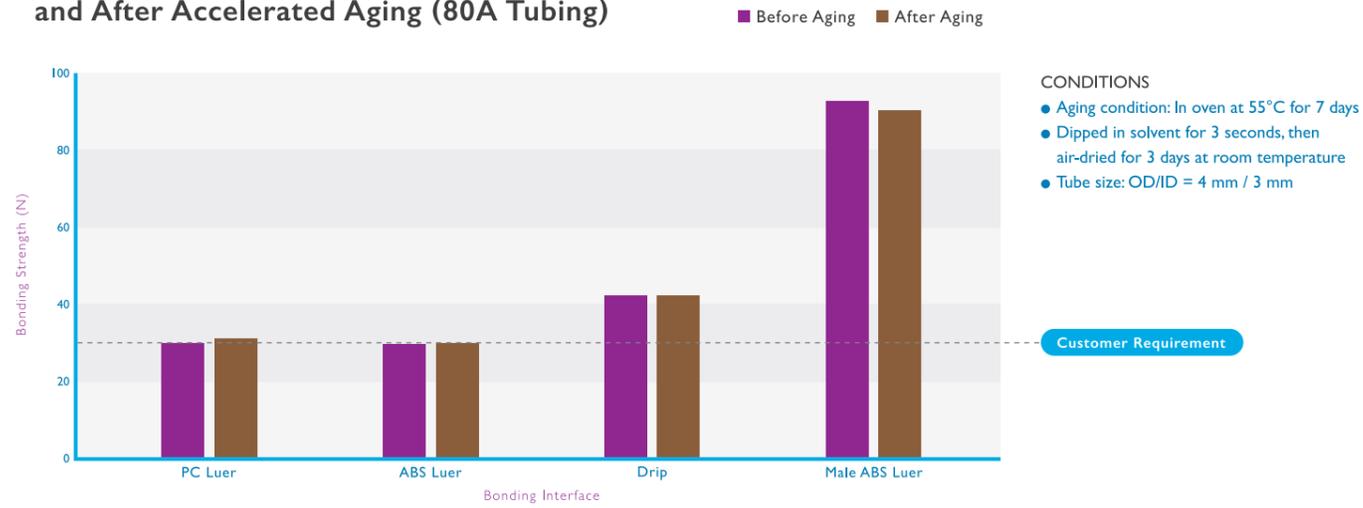
Lower Glass Transition Temperature Than PVC, Offering Better Low-temperature Flexibility



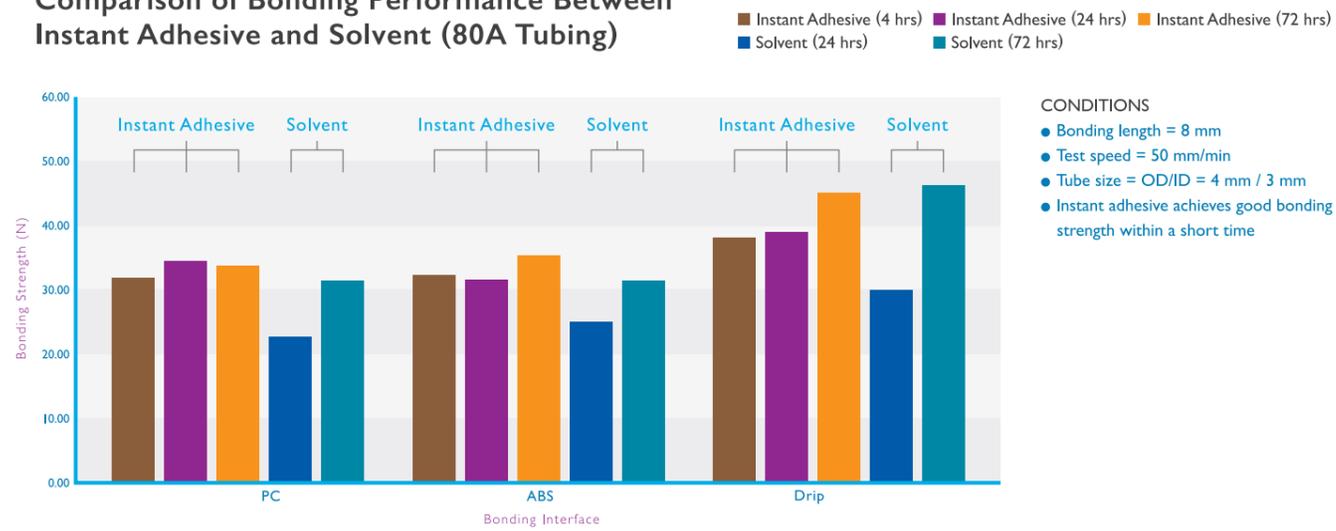
At The Same Hardness, The Tubing's Kink Resistance Test Results are Comparable to PVC Tubing



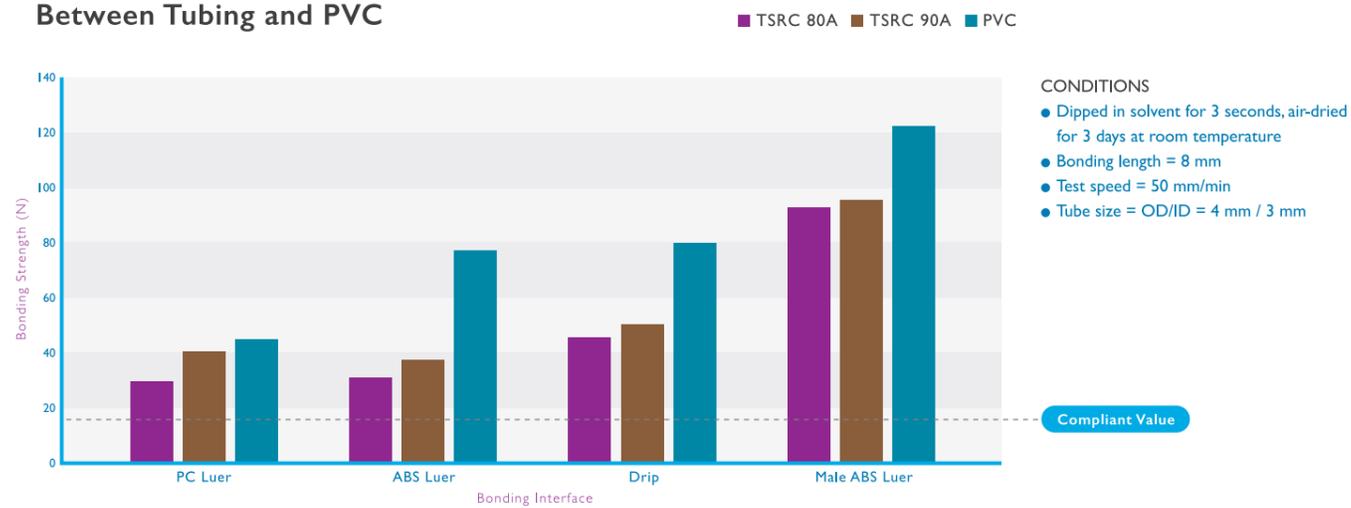
### Comparison of Solvent Bonding Strength Before and After Accelerated Aging (80A Tubing)



### Comparison of Bonding Performance Between Instant Adhesive and Solvent (80A Tubing)



### Comparison of Solvent Bonding Strength Between Tubing and PVC





# IV CHAMBER

- Complies with Medical Regulations
- Contains "0" Plasticizers
- Supports Multi-cavity Molding and Easy Demolding
- Suitable for EtO and Gamma Sterilization

## KEY FEATURES

-  Excellent Scratch Resistance
-  High Transparency
-  Multi-cavity Molding

## Material Properties

TEST ITEM	UNIT	TSRC SOLUTION	PVC
HARDNESS	Shore A	90	92
SPECIFIC GRAVITY	-	0,89	1,25
MFI (230°C/2.16 KG)	g/10min	8	-
TENSILE STRENGTH	Mpa	17	20
ELONGATION	%	550	300
DRIP WEIGHT	g/pcs	2.2	3.5

# MEDICAL COMPOUNDING

## APPLICATIONS

- Medical Film
- Protective Cover

## PROCESSING MODE

- Extrusion Blowing
- Extrusion Casting

## SURGICAL DRAPES

- ▶ Passed ISO 10993-5 and GB/T16886 Test
- ▶ Environmental friendly and recyclability
- ▶ Soft touch
- ▶ Good skid resistance
- ▶ Excellent elasticity
- ▶ Good air permeability
- ▶ Good heat sealing performance

T-BLEND GRADE	UNIT	6002-75L		6007-75L		
Form	-	Pellets		Pellets		
Color	-	Blue		Blue		
Hardness	Shore A	76		75		
Specific Gravity	-	0,95		0,95		
Melt Flow Rate (180°C/5kg)	g/10min	6		3		
Tensile Strength	MPa	65		7		
M300	MPa	45		5		
Elongation	%	500		500		
Tear Strength	MPa	30		4		
FILM	Material Orientation	-	MD	CD	MD	CD
	Tensile Strength	Kgf/cm <sup>2</sup>	123	102	150	140
	Elongation	%	634	597	780	750
	300% Modulus	Kgf/cm <sup>2</sup>	57	49	51	46
	Permanent Set	%	16	16	14	14



### APPLICATIONS

- Tourniquet
- Elastic Band
- Elastic Tape

### PROCESSING MODE

- Extrusion



### APPLICATIONS

- Respiration Equipment

### PROCESSING MODE

- Injection

## TOURNIQUETS

- ▶ Passed ISO 10993-5 and GB/T16886 Test
- ▶ Environmental friendly and recyclability
- ▶ Soft touch
- ▶ Good skid resistance
- ▶ Excellent elasticity

T-BLEND GRADE	UNIT	6102-50N
Form	-	Pellets
Color	-	Natural
Hardness	Shore A	50
Specific Gravity	-	0.91
Melt Flow Rate (180°C/5kg)	g/10min	3
Tensile Strength	MPa	40
M300	MPa	20
Elongation	%	700
Tear Strength	MPa	20

## RESPIRATION EQUIPMENT

- ▶ Passed ISO 10993-5 and GB/T16886 Test
- ▶ FDA 177.1210
- ▶ Soft touch
- ▶ Good skid resistance
- ▶ Excellent elasticity
- ▶ Good heat sealing

T-BLEND GRADE	UNIT	2105-50C	2122-55T	2123-55T
Form	-	Pellets	Pellets	Pellets
Color	-	Transparency	Translucent	Translucent
Hardness	Shore A	55	55	55
Specific Gravity	-	0.88	0.88	0.88
Melt Flow Rate (180°C/5kg)	g/10min	80	25	25
Tensile Strength	MPa	45	70	70
M300	MPa	25	20	20
Elongation	%	500	700	700
Tear Strength	MPa	15	20	20



## APPLICATIONS

- Protective Mask
- Medical Device Protective Cover

## PROCESSING MODE

- Injection

## APPLICATIONS

- Rehabilitation Caster
- Industrial Caster

## PROCESSING MODE

- Injection



## PROTECTIVE MASKS

- ▶ Passed ISO 10993-5 and GB/T16886 Test
- ▶ FDA 177.1210
- ▶ Soft touch
- ▶ Good skin resistance
- ▶ Excellent elasticity
- ▶ Good air permeability
- ▶ Low odor

T-BLEND GRADE	UNIT	2113-35T	2113-45T	2116-50T	2141-55N	2122-55T	2116-60T
Form	-	Pellets	Pellets	Pellets	Pellets	Pellets	Pellets
Color	-	Translucent	Translucent	Translucent	Natural	Translucent	Translucent
Hardness	Shore A	37	45	50	55	58	62
Specific Gravity	-	0.88	0.88	0.88	1.14	0.88	0.88
Melt Flow Rate (180°C/5kg)	g/10min	40	50	50	40	30	100
Tensile Strength	MPa	2.5	3	3	4	6	8
M300	MPa	1.5	2	2	2	2	3
Elongation	%	600	600	400	700	600	700
Tear Strength	MPa	1	1.5	1.5	2	2	2

## INDUSTRIAL CASTER

- ▶ Passed ISO 10993-5 and GB/T16886 Test
- ▶ Silent
- ▶ Anti-sliding
- ▶ Wear resistance
- ▶ Excellent elasticity
- ▶ Suitable for PP overmolding

T-BLEND GRADE	UNIT	0112-45N	0112-55N	0112-65T	0112-75N	0113-75T
Form	-	Pellets	Pellets	Pellets	Pellets	Pellets
Color	-	Natural	Natural	Translucent	Natural	Translucent
Hardness	Shore A	45	55	65	75	75
Specific Gravity	-	1.03	1.02	0.88	0.97	0.88
Melt Flow Rate (180°C/5kg)	g/10min	150	160	8	180	150
Tensile Strength	MPa	5	6	5	10	10
M300	MPa	1.5	2	3.5	3	3
Elongation	%	800	800	600	700	700
Tear Strength	MPa	1.5	1.5	2	3	3



**APPLICATIONS**

- Testing Kit

**PROCESSING MODE**

- Injection



**PROCESSING MODE**

- Injection

**APPLICATIONS**

- Cryogenic Vials

**TESTING KIT**

- ▶ Passed ISO 10993-5
- ▶ Clarity and visibility
- ▶ Viable sterilization through gamma radiation
- ▶ Excellent durability and strength

T-BLEND GRADE	UNIT	6101-90T
Form	-	Pellets
Color	-	Translucent
Hardness	Shore D	43
Specific Gravity	-	0.89
Melt Flow Rate (180°C/5kg)	g/10min	40
Tensile Strength	MPa	150
M300	MPa	100
Elongation	%	500
Tear Strength	MPa	60

**REAGENT GASKET**

- ▶ Passed ISO 10993-5
- ▶ Passed Leakage Test(60°C\*240h)
- ▶ Viable EO sterilization
- ▶ Improved compression set and tightness properties.

T-BLEND GRADE	UNIT	3002-45N
Form	-	Pellets
Color	-	Natural
Hardness	Shore A	45
Specific Gravity	-	0.89
Melt Flow Rate (180°C/5kg)	g/10min	1.5
Tensile Strength	MPa	30
M300	MPa	30
Elongation	%	300
Tear Strength	MPa	10



**APPLICATIONS**

- Cryogenic Vials

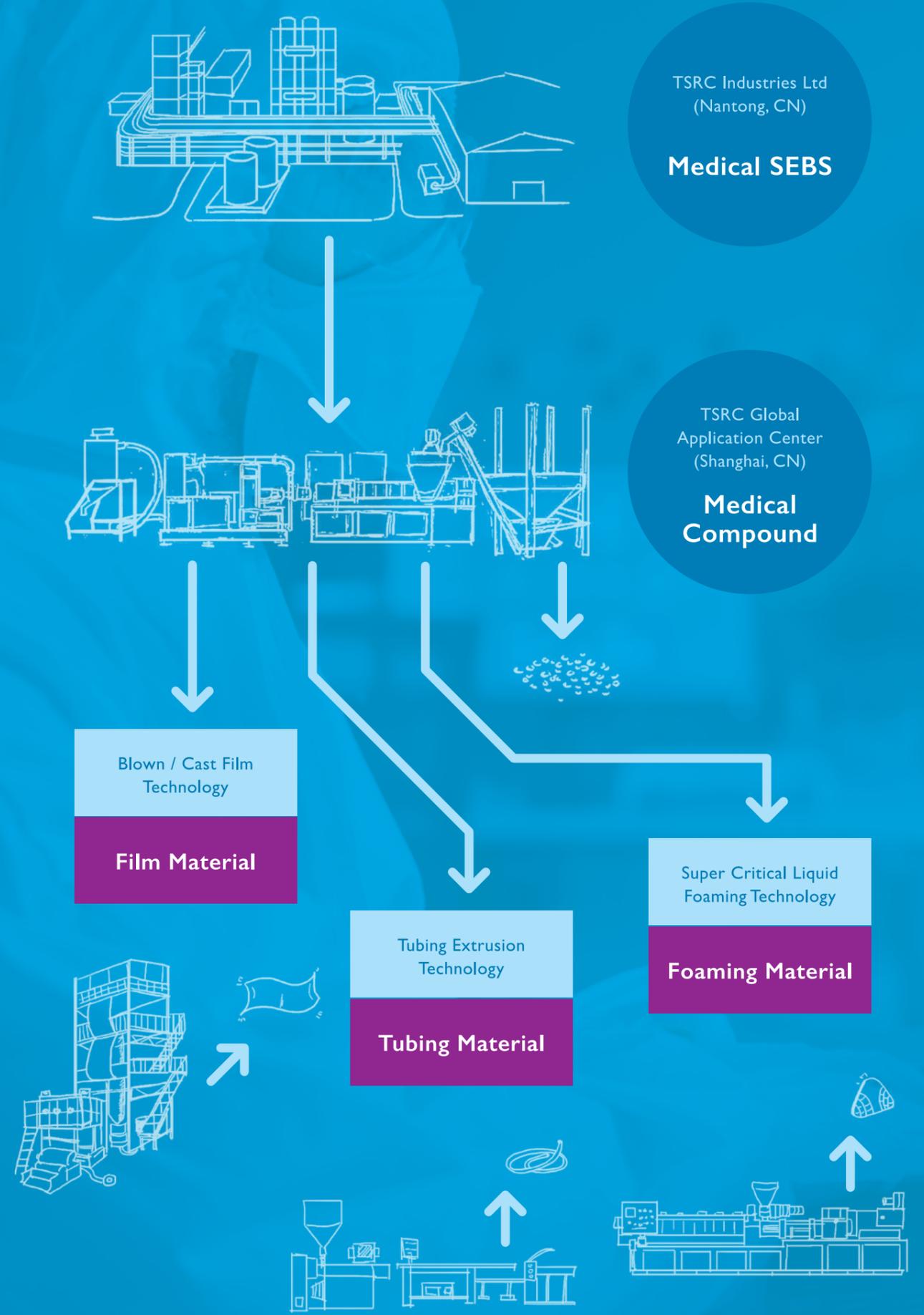
**PROCESSING MODE**

- Injection

**CRYOGENIC VIALS**

- ▶ Passed ISO 10993-5
- ▶ Clarity and visibility
- ▶ Viable sterilization through gamma radiation
- ▶ High Izod notched impact strength
- ▶ Excellent resistant to cryogenic embrittlement, at -196°C for 10 minutes

T-BLEND GRADE	UNIT	2100-95T-50
Form	-	Pellets
Color	-	Translucent
Hardness	Shore D	50
Specific Gravity	-	0.90
Melt Flow Rate (230°C/2.16kg)	g/10min	15
Tensile Strength	MPa	-
M300	MPa	-
Elongation	%	-
Tear Strength	MPa	-



TSRC Industries Ltd  
(Nantong, CN)

**Medical SEBS**

TSRC Global  
Application Center  
(Shanghai, CN)

**Medical Compound**

Super Critical Liquid  
Foaming Technology

**Foaming Material**

Tubing Extrusion  
Technology

**Tubing Material**

Blown / Cast Film  
Technology

**Film Material**



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