Acrylic Advisor

Technical reference guide
for ACRYLITE® & ACRYMID®
acrylic polymers

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Introduction

Acrylic polymers, referred to as polymethyl-methacrylates or PMMA, are amorphous thermoplastic engineering resins known for their:

- high optical properties
- excellent outdoor weathering resistance
- high scratch resistance
- high dimensional stability
- ease of processing

Evonik Cyro LLC, an Evonik Degussa Corporation group company, is a leading manufacturer of acrylic and acrylic-based multipolymer compounds. Our polymers are widely used in lighting, automotive, medical, optics, architectural interiors, point-of-purchase, sanitaryware, and housewares applications that require vastly different end use performance properties. Evonik Cyro markets its products under the ACRYLITE® and ACRYMID® trade names in the Americas. These same products are sold under the PLEXIGLAS® and PLEXIMID® trade names throughout the rest of the world.

Evonik Cyro offers the following product lines:

- ACRYLITE® acrylic polymers
- ACRYLITE® Satinice df acrylic polymers
- ACRYLITE® MD acrylic polymers
- ACRYLITE® Resist™ acrylic polymers
- ACRYLITE® Hi-Gloss acrylic polymers
- ACRYMID® Heatresist acrylic polymers
- ACRYLITE® Heatresist acrylic polymers

ACRYLITE®

ACRYLITE is Evonik Cyro's standard acrylic product line. ACRYLITE® acrylic polymers are available in grades that vary according to four manufacturing variables:

- molecular weight
- co-monomer content
- lubricant content
- ultraviolet light transmission

These variations control the physical and rheological properties of each material.

- High molecular weight acrylics generally exhibit higher strength properties and lower melt flow rates.
- Low molecular weight acrylic with high co-monomer content will exhibit lower strength and higher melt flow rates.
- Lubricant is added to facilitate ejection of molded parts with low draft angles and aid in processing. The higher the level of lubricant, the more easily parts are ejected and the easier the material will flow.
- Ultraviolet light transmission properties can be adjusted from the maximum UV transmitting to high UV absorbing.

ACRYLITE 8H, 8N and H15 acrylic polymers are considered high molecular weight acrylics containing the lowest co-monomer content. These two factors contribute to the high rigidity, high heat resistance characteristics and the lower melt flow rates.

ACRYLITE Satinice df 23 8N acrylic polymer is a specialty grade offering high light diffusion efficiency while retaining similar characteristics to ACRYLITE Satinice df 8N polymer.

All grades of ACRYLITE polymers are available in clear and a wide range of transparent, translucent and opaque colors. Specialty colors can be produced on a made-to-order basis.

Typical Applications

- Automotive lighting lenses, light pipes and instrument panel lenses
- Solar photovoltaic lenses
- Lighting globes and fixtures for outdoor lighting
- High heat lighting applications for diagnostic and surgical; marine signaling; roads and runways
- Medical diagnostic parts including cuvettes, test packs, rotors, microfluidics and crystallography trays
- Optical lenses
- LCD displays
- High efficiency LED lighting
- Houswares
- P-O-P displays
- Architectural blocks

ACRYLITE® and ACRYLITE® Satinice df

Description of Grades

ACRYLITE 8H polymer
highest heat resistance/service temperature (DTL/Vicat), optimum mechanical properties, excellent weatherability

ACRYLITE 8N polymer
highest heat resistance/service temperature (DTL/Vicat), higher mechanical properties, excellent weatherability

ACRYLITE H15 polymer
high heat resistance/service temperature (DTL/Vicat), high mechanical properties, excellent weatherability

ACRYLITE M30 polymer
medium heat resistance/service temperature (DTL/Vicat), high mechanical properties, excellent weatherability, ease of flow

ACRYLITE Satinice df 20 8N polymer
90% light transmittance, medium hiding power

ACRYLITE Satinice df 21 8N polymer
90% light transmittance, medium to high hiding power

ACRYLITE Satinice df 22 8N polymer
88% light transmittance, high hiding power

ACRYLITE Satinice df 23 8N polymer
86% light transmittance, highest hiding power

Physical Properties

Property	ASTM Method	8H	8N	H15	M30
OPTICAL					
Light Transmission, %	D-1003	92	92	92	92
Haze, %	D-1003	<1	<1	<1	<1
Refractive Index	D-542	1.49	1.49	1.49	1.49
RHEOLOGICAL					
Avg Melt Flow, g/10 min @ 230°C & 3.8 kg	D-1238	0.7	3.4	2.2	24.0
MECHANICAL					
Tensile Strength, psi (MPa)	D-638	11300 (77.9)	11,300 (77.9)	9,800 (67.6)	9,200 (63.4)
Tensile Modulus, x10^6 psi (GPa)	D-638	0.49 (3.3)	0.47 (3.2)	0.47 (3.2)	0.47 (3.2)
Tensile Elongation @ Yield, %	D-638	6 – 8	4 – 6	4 – 6	2 – 4
Tensile Elongation @ Break, %	D-638	6 – 8	4 – 6	4 – 6	2 – 4
Flexural Strength, psi (MPa)	D-790	17,900 (123)	16,200 (111.7)	17,000 (117.2)	15,500 (106.9)
Flexural Modulus, x 10^6 psi (GPa)	D-790	–	0.50 (3.5)	0.49 (3.4)	0.46 (3.2)
Notched Izod, ft-lb/in (J/m) ¼" (6.35mm) bar @ 23°C	D-256	0.53 (3.6)	0.36 (19)	0.36 (19)	0.36 (19)
Compressive Strength, psi (MPa)	D-695	17,000 (117.2)	17,000 (117.2)	17,000 (117.2)	15,500 (106.9)
Rockwell Hardness, M scale	D-785	98	95	95	89
PHYSICAL					
DTL, °F (°C) @ 264 psi, annealed	D-648	212 (100)	212 (100)	203 (96)	180 (82)
Vicat Softening Point, °F (°C)	D-1525	226 (108)	226 (108)	221 (105)	194 (90)
Specific Gravity	D-792	1.19	1.19	1.19	1.19
Water Absorption, % max	D-570	0.3	0.3	0.3	0.3
Mold Shrinkage, in/in, mm/mm	D-955	0.004 – 0.006	0.004 – 0.007	0.004 – 0.007	0.003 – 0.006
Coefficient of Linear Expansion in/in/°F, 32 – 212°F (mm/mm °C, 0 – 100°C)	D-696	0.00004 (0.000072)	0.00004 (0.000072)	0.00004 (0.000072)	0.00004 (0.000072)
Flammability		UL 94 HB (f1)	UL 94 HB (f1)	UL 94 HB (f1)	UL 94 HB (f1)
Classification	D-788-93	PMMA0132V1	PMMA0140V3	PMMA0140V2	PMMA0130V4

For alternative flow grades, H12 and L40, see page 14.

This chart is continued on pages 8 & 9

ACRYLITE® Satinice df

Physical Properties

Property	ASTM Method	df 20 8N	df 21 8N	df 22 8N	df 23 8N
OPTICAL					
Light Transmission, %	D-1003	90	90	88	86
Haze, %	D-1003	50	83	94	96
Refractive Index	D-542	1.492	1.496	1,498	1,498
Yellowness Index	D-1925	< 6.5	< 6.5	< 6.5	< 6.5
RHEOLOGICAL					
Avg Melt Flow, g/10 min @ 230°C & 3.8 kg	D-1238	3.2	3.1	3.0	2.9
MECHANICAL					
Tensile Strength, psi (MPa)	D-638	11,350 (78.3)	11,500 (79.3)	11,500 (79.3)	11,500 (79.3)
Tensile Modulus, $x10^6$ psi (GPa)	D-638	0.54 (3.7)	0.55 (3.8)	0.55 (3.8)	0.55 (3.8)
Tensile Elongation @ Yield, %	D-638	4	4	4	4
Tensile Elongation @ Break, %	D-638	4	4	4	4
Flexural Strength, psi (MPa)	D-790	19,000 (131)	20,000 (138)	20,000 (138)	19,000 (131)
Flexural Modulus, $x10^{\wedge 6}$ psi (GPa)	D-790	0.50 (3.5)	0.50 (3.5)	0.50 (3.5)	0.50 (3.5)
Notched Izod, ft-lb/in (J/m) ¼" (6.35mm) bar @ 23°C	D-256	0.3 (16)	0.3 (16)	0.3 (16)	0.3 (16)
Compressive Strength, psi (MPa)	D-695	–	–	–	–
Rockwell Hardness, M scale	D-785	95	95	95	95
PHYSICAL					
DTL, °F (°C) @ 264 psi, annealed	D-648	221 (105)	221 (105)	221 (105)	221 (105)
Vicat Softening Point, °F (°C)	D-1525	243 (117)	246 (119)	246 (119)	246 (119)
Specific Gravity	D-792	1.19	1.19	1.19	1.19
Water Absorption, % max	D-570	0.3	0.3	0.3	0.3
Mold Shrinkage, in/in, mm/mm	D-955	0.003 – 0.006	0.003 – 0.006	0.003 – 0.006	0.003 – 0.006
Coefficient of Linear Expansion in/in/°F, 32 212°F (mm/mm °C, 0 – 100°C)	D-696	0.00004 (0.000072)	0.00004 (0.000072)	0.00004 (0.000072)	0.00004 (0.000072)
Flammability		UL 94 HB (f1)	UL 94 HB (f1)	UL 94 HB (f1)	UL 94 HB (f1)
Classification	D-788-93	PMMA0122V7	PMMA0112V7	PMMA0140V2	PMMA0140V2

This chart is continued from pages 6 & 7

ACRYLITE® and ACRYLITE® Satinice df

Processing Conditions – Injection Molding

Condition	8H	8N	H15	M30	8N df grades
Drying Temperature, °F (3 – 4 hours)	175	175	175	175	175
Melt Temperature, °F (3 – 4 hours)	465 – 485	465 – 485	460 – 480	410 – 470	465 – 485
Mold Temperature, °F (3 – 4 hours)	100 – 175	100 – 175	90 – 175	90 – 175	100 – 175
Injection Pressure, psi	6,000 – 15,000	6,000 – 15,000	6,000 – 15,000	6,000 – 15,000	6,000 – 15,000
Clamp Pressure (2.5 tons/in² of projected area for flow – Length/wall thickness < 100/1) (5 tons/in² of projected area for flow – Length/wall thickness > 100/1)					
Screw Speed, rpm 2:1 compression ratio 3.5:1 compression ratio	 75 – 150 60 – 130	 75 – 150 60 – 130	 75 – 150 60 – 130	 75 – 150 60 – 130	 75 – 150 60 – 130
Ram Speed, in/sec – small gates	0.5 – 1.5	0.5 – 1.5	0.5 – 1.5	0.5 – 1.5	0.5 – 1.5
Ram Speed, in/sec – large gates	1 – 4	1 – 4	1 – 4	1 – 4	1 – 4
Back Pressure, psi	25 – 100	25 – 100	25 – 100	25 – 100	25 – 100

Processing Conditions – Extrusion

Typical screw geometries and machine settings for sheet extrusion
(two stage screw with L/D of 30/1 assumed)

Screw Diameter	3 ½ inch	4 ½ inch	6 inch
Turns of Feed – Constant Depth	4 at 0.400	4 at 0.625	7 at 0.635
Turns of Transition – Constant Taper	3	3	3
Turns of Meter Pump – Constant	5 at 0.165	5 at 0.180	4 at 0.190
Turns of Decompression Constant Taper	1	1	1
Turns of Vent Zone – Constant Depth	4 at 0.650	4 at 0.750	at 0.750
Turns of Recompression – Constant Taper	2.5	2.5	2.0
Turns of 2nd Meter Pump – Constant Taper	5 at 0.280	5 at 0.305	5 at 0.320
Feed Zone °F	350 – 400	340 – 400	280 – 320
Rear °F	380 – 420	380 – 415	320 – 360
Rear Center °F	380 – 425	380 – 425	360 – 420
Center °F	390 – 430	380 – 425	400 – 440
Front Center °F	420 – 470	420 – 460	420 – 460
Front °F	430 – 475	420 – 460	420 – 460
Adapter °F	450 – 470	450 – 470	460
Die End Plates °F	450 – 470	450 – 470	470
Die Left and Right °F	440 – 470	440 – 470	460
Die Center °F	440 – 470	440 – 470	460
Approximate Output (lb/hr)	440 – 550	800 – 1000	1300 – 1800
Drive Horsepower	75 – 100	125 – 174	200 – 300

ACRYLITE® MD™

ACRYLITE® MD™ acrylic polymers for medical diagnostic applications offer exceptional ultra-violet light transmittance (UVT) and optical clarity while providing maximum flow characteristics and high dimensional stability. Both grades are suitable for applications such as diagnostic test packs, and containers and accessories requiring USP Class VI and food contact FDA 21CFR177.1010 compliance.

When tested following the Tripartite / ISO 10993-1 protocols, both grades have been found to be:

- non-hemolytic
- non-cytotoxic
- non-pyrogenic
- non-sensitizing
- non-mutagenic

ACRYLITE MD polymers performance formulations offer:

- Exceptional ultra-violet light transmittance (UVT) to ensure consistent measurement response
- Excellent optical clarity for maximum visible inspection capabilities
- Maximum flow characteristics for high cavitation tooling and improved production efficiency
- Good dimensional stability for controlled fluid flow
- Regulatory compliance for quality control
- Total cost-of-use advantage over glass

Meeting the stringent performance and regulatory compliance requirements of medical designs, ACRYLITE MD polymers are well suited for diagnostic applications such as:

- cuvettes
- test packs
- rotors
- crystallography trays

ACRYLITE® MD™

Description of Grades

ACRYLITE MD H12 polymer

medium flow, medium heat resistant, lubricant-free grade

ACRYLITE MD L40 polymer

high flow, low heat resistant, medium lubricated grade suitable for fast cycling and multi-cavity applications

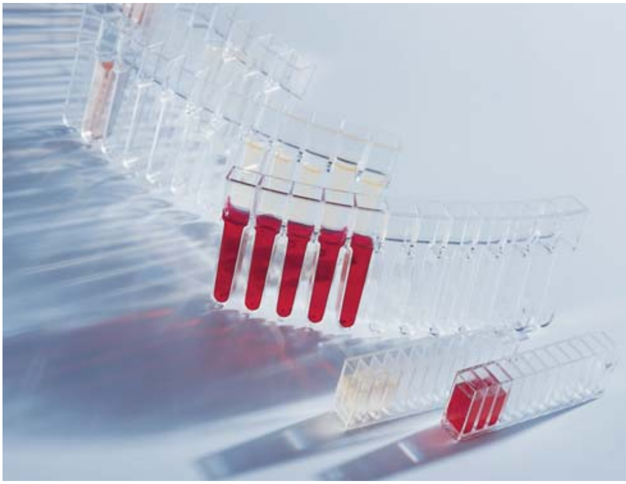
H12 and L40 are both available as standard grades.

Check with your Evonik sales representative for a UV transmittance specification.

ACRYLITE® MD™

Physical Properties

Property	ASTM Method	MD H12	MD L40
OPTICAL			
Light Transmission, %	D-1003	92	92
UV Transmittance 340 nm, %	–	min. 87.7	min. 87.7
Haze, %	D-1003	<1	<1
Refractive Index	D-542	1.49	1.49
Yellowness Index	D-1925	< 1	< 1
RHEOLOGICAL			
Melt Flow, g/10 min @ 230°C & 3.8 kg	D-1238	7.0	26
MECHANICAL			
Tensile Strength, psi (MPa)	D-638	9500 (65.5)	8800 (60.7)
Tensile Modulus, x10^6 psi (GPa)	D-638	0.47 (3.2)	0.47 (3.2)
Tensile Elongation @ Yield, %	D-638	4 – 6	2 – 4
Tensile Elongation @ Break, %	D-638	4 – 6	2 – 4
Flexural Strength, psi (MPa)	D-790	17000 (117.2)	14200 (97.9)
Flexural Modulus, x10^6 psi (GPa)	D-790	0.49 (3.4)	0.44 (3.0)
Notched Izod, ft-lb/in (J/m) ¼" (6.35mm) bar @ 23°C	D-256	0.36 (19)	0.36 (19)
Compressive Strength, psi (MPa)	D-695	17000 (117.2)	13700 (94.5)
Rockwell Hardness, M scale	D-785	94	84
PHYSICAL			
DTL, °F (°C) @ 264 psi, annealed	D-648	201 (95)	165 (74)
Vicat Softening Point, °F (°C)	D-1525	221 (105)	180 (82)
Specific Gravity	D-792	1.19	1.19
Water Absorption, % max	D-570	0.3	0.3
Mold Shrinkage, in/in, mm/mm	D-955	0.004 – 0.006	0.003 – 0.006
Coefficient of Linear Expansion in/in/°F, 32 212°F (mm/mm °C, 0 – 100°C)	D-696	0.00004 (0.000072)	0.00004 (0.000072)
UL Flammability Class		UL 94 HB (f1)	UL 94 HB (f1)
Classification	D-788-93	PMMA 0130V4	PMMA 0112V7



Processing Conditions - Injection Molding

	MD H12	MD L40
Drying Temperature, °F (3 – 4 hours)	170	160
Melt Temperature, °F (3 – 4 hours)	430 – 480	410 – 470
Mold Temperature, °F (3 – 4 hours)	90 – 175	80 – 160
Injection Pressure, psi	6,000 – 15,000	6,000 – 15,000
Clamp Pressure (2.5 tons/in² of projected area for flow – Length/wall thickness < 100/1) (5 tons/in² of projected area for flow – Length/wall thickness > 100/1)		
Screw Speed, rpm 2:1 compression ratio 3.5:1 compression ratio	 75 – 150 60 – 130	 75 – 150 60 – 130
Ram Speed, in/sec small gates large gates	 0.5 – 1.5 1 – 4	 0.5 – 1.5 1 – 4
Back Pressure, psi	25 – 100	25 – 100

ACRYLITE® Resist™

(formerly known as ACRYLITE PLUS®)

ACRYLITE® Resist™ acrylic polymers are specially formulated to offer:

- enhanced impact resistance and toughness
- clarity similar to standard PMMA
- resistance to adverse effects of outdoor weathering
- chemical resistance

ACRYLITE Resist acrylic polymers will retain both their physical properties and appearance after long periods of outdoor exposure. ACRYLITE Resist polymers vary according to molecular weight, co-monomer content, rubber modifier and lubricant content. Depending on the application requirements, there is an ACRYLITE Resist grade that can provide the optimum balance of impact resistance and melt flow properties. A high amount of rubber modifier will correspond to high impact resistance and lower mechanical properties and melt flow rates.

ACRYLITE Resist acrylic polymers are available in ten different grades: ZK-6, ZK-D, ZK6SR, ZK-M, ZK-F, ZK-X, ZK-5HG, ZK-4HR, ZK-3HR and zdf.

ACRYLITE Resist ZK-6BR, ZK-6HF, and ZK-6SR polymers contain the highest rubber loading and, therefore, provide the maximum impact strength.

ACRYLITE Resist ZK-6SR polymer
is specially formulated to provide high melt strength for extrusion applications.

ACRYLITE Resist zdf polymer
is a special impact light diffusion acrylic polymer for molding and extrusion applications.

ACRYLITE Resist polymer
can be easily blended with ACRYLITE acrylic polymers to further optimize impact strength and processability.

ACRYLITE® Resist™

Typical Applications

- Lighting
- Glazing
- Automotive lenses and trim
- Engraving stock
- Surface protection i.e. hoods, golf carts, lawn tractors, snowmobiles
- Housings for consumer products i.e. hot tubs, shower surrounds
- Personal accessories i.e. toothbrushes
- Signs
- Sanitaryware
- Window profiles

Description of Grades

Resist Grade	Melt Flow Rate (g/10 min)	Izod Impact Notched (fppi)	Description
ZK-6	1.7	1.1	High impact strength, low flow, UV absorbing, low lubricant level
ZK-D	5.8	1.1	High impact strength, medium flow, UV absorbing, low lubricant level
ZK-6SR	1.3	1.1	High impact strength, low flow, UV absorbing, low lubricant level. Extrusion Grade
ZK-M	3.5	0.85	Medium impact strength, medium flow, UV absorbing, low lubricant level
ZK-F	13.0	0.75	Medium impact strength, high flow, UV absorbing, low lubricant level
ZK-X	1.0	0.85	Medium impact strength, low flow, UV absorbing, low lubricant level
ZK-5HG	1.8	0.70	Medium impact strength, low flow, high UVA, high gloss
ZK-4HR	3.1	0.45	Low impact strength, medium flow, UV absorbing, low lubricant level, heat resistant
ZK-3HR	3.2	0.45	Low impact strength, low flow, UV absorbing, low lubricant level, heat resistant
zdf	3.1	1.0	Translucent light diffusing, high impact strength, medium flow, UV absorbing, low lubricant level

ACRYLITE® Resist™

Physical Properties

Property	ASTM Method	ZK-6	ZK6SR	ZK-D	ZK-M	ZK-F
OPTICAL						
Light Transmission, %	D-1003	91.5	91	91.5	91.5	92
Haze, %	D-1003	1	1	1	1	1
Refractive Index	D-542	1.49	1.49	1.49	1.49	1.49
RHEOLOGICAL						
Avg Melt Flow, g/10 min @ 230°C & 3.8 kg	D-1238	1.7	1.3	5.8	3.5	13.0
MECHANICAL						
Tensile Strength, psi (MPa)	D-638	6,300 (43.4)	6,000 (41)	6,400 (44.1)	8,500 (58.6)	8,200 (56.2)
Tensile Modulus, x10⁶ psi (GPa)	D-638	0.22 (1.5)	0.23 (1.6)	0.23 (1.6)	0.32 (2.2)	0.33 (2.3)
Tensile Elongation @ Yield, %	D-638	5	5	5	5	5
Tensile Elongation @ Break, %	D-638	55	60	40	30	25
Flexural Strength, psi (MPa)	D-790	8,600 (59.3)	8,000 (55.2)	9,400 (64.8)	13,000 (89.6)	10,000 (68.9)
Flexural Modulus, x10⁶ psi (GPa)	D-790	0.22 (1.5)	0.2 (1.4)	0.23 (1.6)	0.32 (2.2)	0.29 (2.0)
Notched Izod, ft-lb/in (J/m) ¼" (6.35mm) bar @ 23°C ¼" (6.35mm) bar @ 0°C	 D-256 D-256	 1.1 (58.1) 0.70 (36.8)	 1.1 (58.1) 0.8 (43)	 1.1 (58.1) 0.65 (34.1)	 0.85 (44.9) 0.50 (26.3)	 0.75 (39.6) 0.45 (23.9)
Rockwell Hardness, M scale	D-785	40	40	33	68	65
PHYSICAL						
DTL, °F (°C) @ 264 psi, annealed	D-648	194 (90)	181 (83)	190 (88)	196 (91)	196 (91
Vicat Softening Point, °F (°C)	D-1525	201 (94)	196 (91)	201 (94))	210 (99)	208 (98)
Specific Gravity	D-792	1.16	1.16	1.16	1.18	1.17
Water Absorption, % max	D-570	0.3	0.3	0.3	0.3	0.3
Mold Shrinkage, in/in, mm/mm	D-955	0.004-0.007	0.004 – 0.007	0.003-0.006	0.003-0.006	0.003-0.006
Coefficient of Linear Expansion in/in/°F, 32 – 212° (mm/mm °C, 0 – 100°C)	D-696	0.00004 (0.000072)	0.00005 (0.000077)	0.00004 (0.000072)	0.00004 (0.000072)	0.00004 (0.000072)
Flammability		UL 94 HB (f1)	UL 94 HB (f1)	UL 94 HB	UL 94 HB (f1)	UL 94 HB
Classification	D-788-93	PMMA 0231V1	PMMA 0231V1	PMMA 0221V3	PMMA 0221V3	PMMA 0221V5

This chart is continued on pages 20 & 21

ACRYLITE® Resist™

Physical Properties

Property	ASTM Method	ZK-X	ZK-5HG	ZK-4HR	ZK-3HR	zdf
OPTICAL						
Light Transmission, %	D-1003	91.5	91	91.5	91	85
Haze, %	D-1003	1	1	1	1	96
Refractive Index	D-542	1.49	1.49	1.49	1.49	1.49
RHEOLOGICAL						
Avg Melt Flow, g/10 min @ 230°C & 3.8 kg	D-1238	1.0	1.8	3.1	3.2	3.1
MECHANICAL						
Tensile Strength, psi (MPa)	D-638	9,300 (64.1)	6,200 (42.7)	11,200 (77.2)	11,900 (77.2)	6,400 (44.1)
Tensile Modulus, $x10^6$ psi (GPa)	D-638	0.37 (2.5)	0.23 (1.6)	0.32 (2.2)	0.48 (3.3)	0.25 (1.8)
Tensile Elongation @ Yield, %	D-638	5	6	5	5.0	8
Tensile Elongation @ Break, %	D-638	25	30	20	15	20
Flexural Strength, psi (MPa)	D-790	15,000 (103.4)	9,400 (64.8)	14,500 (99.9)	15,040 (104)	10,000 (69.5)
Flexural Modulus, x106 psi (GPa)	D-790	0.35 (2.5)	0.23 (1.57)	0.32 (2.2)	0.32 (2.2)	0.26 (1.8)
Notched Izod, ft-lb/in (J/m) ¼" (6.35mm) bar @ 23°C ¼" (6.35mm) bar @ 0°C	 D-256 D-256	 0.85 (44.9) 0.60 (31.7)	 0.70 (36.7) 0.66 (34.6)	 0.45 (23.4) 0.35 (18.5)	 0.45 (23.6) 0.40 (20.8)	 1.0 (52.5) 0.50 (26.3)
Rockwell Hardness, M scale	D-785	70	38	89	92	44
PHYSICAL						
DTL, °F (°C) @ 264 psi, annealed	D-648	200 (93)	183 (95)	198 (92)	198 (92)	185 (85)
Vicat Softening Point, °F (°C)	D-1525	230 (110)	192 (89)	214 (101)	217 (103)	226 (108)
Specific Gravity	D-792	1.16	1.15	1.17	1.17	1.15
Water Absorption, % max	D-570	0.3	0.3	0.3	0.3	0.3
Mold Shrinkage, in/in, mm/mm	D-955	0.003 – 0.006	0.003 – 0.006	0.003 – 0.006	0.004 – 0.007	0.003 – 0.006
Coefficient of Linear Expansion in/in/°F, 32 – 212° (mm/mm °C, 0 – 100°C)	D-696	0.00004 (0.000072)	0.00004 (0.000072)	0.00004 (0.000072)	0.00004 (0.000072)	0.00004 0.000072
Flammability		UL 94 HB (f2)	–	–	–	UL 94 HB
0.052 in	D-788-93	PMMA 0221V1	PMMA 0221V5	PMMA 0211V3	PMMA 0211V2	PMMA 0231V2

This chart is continued from pages 18 & 19

ACRYLITE® Resist™

Processing Conditions – Injection Molding

Condition	Suggested	Starting Point
Drying Temperature, °F (3 – 4 hours)	180 (82°C)	180 (82°C)
Melt Temperature, °F	450 – 480 (232 – 250°C)	460 (238°C)
Mold Temperature, °F	110 – 180 (38 – 82°C)	140 (60°C)
Injection Pressure, psi (MPa)	6,000 – 15,000 (40 – 100)	10,000 (69)
Clamp Pressure (2.5 tons/in² of projected area for flow – Length/wall thickness <100/1) (5.0 tons/in² of projected area for flow – Length/wall thickness >100/1)		
Screw Speed, rpm 2:1 compression ratio 3.5:1 compression ratio	 75 – 150 60 – 130	 100 80
Ram Speed, in/sec small gates large gates	 0.5 – 1.5 1 – 4	 1.0 2.0
Back Pressure, psi (MPa)	50 – 150 (0.14 – 0.70)	100 (0.69)

Processing Conditions – Extrusion

Condition	°F	°C
Feed Zone	390 – 410	199 – 210
Rear Center	410 – 430	210 – 221
Center	440 – 470	226 – 243
Front	440 – 470	226 – 243
Adapter	450 – 470	232 – 243
Die	420 – 450	216 – 232
Polishing Roll Temperature	180 – 220	82 – 104

ACRYLITE Hi-Gloss acrylic polymers have long been the preferred materials for manufacturing highly weatherable exterior automotive components. Evonik has set the standard in the use of specialty acrylics for non-transparent trim applications for the automotive and electronics markets with ACRYLITE Hi-Gloss polymers.

ACRYLITE Hi-Gloss polymers offer outstanding features and benefits:

- Excellent weather resistance for lifetime durability
- Depth of color for outstanding appearance
- High-gloss surface (Class A) for lasting appeal
- Superior surface hardness delivers abrasion resistance
- High rigidity for good dimensional stability
- Good chemical resistance offers protection from environmental damage
- Polishable to remove small surface scratches
- 100% recyclable – environmentally friendly (meets ELV mandates)

For enhanced bottom-line results, including:

- Ease of processing for efficient molding and stable part production
- Cost-effectiveness (cost savings as compared with painted systems)
- Reliable technical assistance worldwide

Typical Applications:

- Automotive trim parts
- Decorative appliques
- Mirror housings
- Roof elements
- Bezel surroundings

ACRYLITE® Hi-Gloss

Description of Grades

Grade	Melt Flow Rate (g/10 min)	Izod Impact Notched (kJ/m²)	Description
FT-8	3.5	2.0	Excellence balance of properties with good flow
NTA-1	3.5	1.9	High heat resistance (110°C)
NTA-3	2.4	1.5	High heat resistance (116°C)

ACRYLITE® Hi-Gloss

Physical Properties

Property	Units	Standard	FT8	NTA 1	NTA 3
RHEOLOGICAL					
Melt volume-flow rate MVR (230/3.8)	cm3/10 min	ISO 1133	3	3	2
MECHANICAL					
Tensile modulus (1 mm/min)	MPa	ISO 527	3300	2700	2900
Yield stress (50 mm/min)	MPa	ISO 527	77 (1)	68	60
Elongation at yield (50 mm/min)	%	ISO 527	–	5	1
Nominal elongation at break	%	ISO 527	5.5 (2)	10	2.6
Charpy impact strength (23°C)	kJ/m2	ISO 179	20	33	16
PHYSICAL					
Vicat softening temperature (B/50)	°C	ISO 306	108	110	116
Glass transition temperature	°C	IEC 10006	117	120	126
Heat deflection temperature under load (1.8 MPa)	°C	ISO 75	98	102	106
Density	g/cm3	ISO 1183	1.19	1.18	1.18
Water absorption	% max	ISO 62	–	> 3 %	> 3 %
Fire rating	–	DIN 4102	B2	B2	B2
Flammability UL 94 at nom. 1.6 mm	Class	IEC 707	HB	HB	HB

1 Fracture stress (5 mm/min)
2 Elongation at break (5 mm/min)

ACRYLITE® Hi-Gloss

Processing Conditions – Injection Molding

Condition	FT-8	NTA-1	NTA-3
Drying Temperature, °F (°C) 3-4 hours	208 (98) Max	212 (100) Max	212 (100) Max
Melt Temperature, °F (°C) 3-4 hours	428 – 500 (220 – 260)	428 – 482 (220 – 250)	428 – 482 (220 – 250)
Mold Temperature, °F (°C) 3-4 hours	140 – 194 (60 – 90)	122 – 185 (50 – 85)	122 – 185 (50 – 85)
Injection Pressure, psi (MPa)	6,000 – 15,000 (41 – 103)	6,000 – 15,000 (41 – 103)	6,000 – 15,000 (41 – 103)
Clamp Pressure 2.5 Tons/in^2 (38 MPa) of projected area for flow length/wall thickness < 100/1 5 Tons/in^2 (77 MPa) of projected area for flow length/wall thickness > 100/1			
Screw Speed, rpm 2:1 compression ratio 3.5:1 compression ratio	 75 – 150 60 – 130	 75 – 150 60 – 130	 75 – 150 60 – 130
Ram Speed, in/sec – small gates	0.5 – 1.5 (12.7 – 38)	0.5 – 1.5 (12.7 – 38)	0.5 – 1.5 (12.7 – 38)
Ram Speed, in/sec – large gates	1 – 4 (25.4 – 101)	1 – 4 (25.4 – 101)	1 – 4 (25.4 – 101)
Back Pressure, psi (MPa)	50 – 150 (0.34 – 1)	50 – 150 (0.34 – 1)	50 – 150 (0.34 – 1)

ACRYMID® and ACRYLITE® Heatresist

Evonik offers the widest range of acrylic polymers for optical, thermal, and outdoor LED lighting applications. Our polymers offer excellent optics which yield high efficiencies in all types of demanding lighting applications. Products can be colored to various levels of transparency or to fully opaque, including brilliant white to high gloss piano black. Special UV blocking and HID grades are available.

ACRYMID® is an ultra high heat, weatherable acrylic polymer that features:

- High heat distortion resistance
- Excellent transmission and clarity
- High vicat softening temperature
- High strength and rigidity
- Good weather resistance
- High surface hardness
- High chemical resistance

AMECA listed Heatresist products:

- ACRYLITE® Heatresist hw55
- ACRYMID® TT50

Typical Applications:

- High efficiency LED light engines
- Optical lenses
- Fiber optics
- Lighting fixtures
- Nameplates
- High temperature sight glasses
- Luminary covers
- Automotive

Description of Grades

Grade	Vicat Temperature Resistance
ACRYMID TT70	170°C Vicat temperature resistance
ACRYMID TT50	150°C Vicat temperature resistance
ACRYMID 813	130°C Vicat temperature resistance
ACRYLITE Heatresist hw55	120°C Vicat temperature resistance
ACRYLITE Heatresist FT15*	115°C Vicat temperature resistance

*FT15 in black and opaque colors are available for high gloss applications.

ACRYMID® and ACRYLITE® Heatresist

Physical Properties

Typical Values	Method	ACRYMID TT70	ACRYMID TT50	ACRYMID 813	ACRYLITE Heatresist hw55	ACRYLITE Heatresist FT15
OPTICAL						
Transmission Factor, % @ D65 / 10°	ISO 13468-2	91	91	90	91	91
Haze, %	ASTM D 1003	< 1	< 1	< 1	< 1.5	< 1
Yellowness Index	ASTM E 313	< 1	< 1	< 1	< 0.5	< 0.5
Refractive Index	ISO 489	1.536	1.530	1.512	1.512	1.500
RHEOLOGICAL						
Melt Volume Rate, cm^3/10 min [230°C & 3.8 kg]	ISO 1133	–	–	–	1.2	4.5
Melt Volume Rate, cm^3/10 min [260°C & 10 kg]	ISO 1133	1.7	5.0	20.0	–	–
MECHANICAL						
Tensile Modulus, MPa @ 1mm/min	ISO 527	4000	4000	4000	3600	3500
Stress @ Break, MPa @ 5mm/min	ISO 527	80	80	85	80	50
Strain @ Break, % @ 5 mm/min	ISO 527	3	3	4	3.5	3.1
Charpy Impact Strength, kJ/m^2 23 °C	ISO 179/1eU	20	20	20	20	18
Ball Hardness H961/30 MPa	DIN 53 456	211	201	200	211	202
PHYSICAL						
Vicat Softening Point, °C @ B/50	ISO 306	170	150	130	120	115
Deflection Temperature, °C @ 0.45 MPa °C @ 1.8 MPa	ISO 75	158 149	140 132	118 111	109 106	107 105
Density, g/cm3	ISO 1183	1.21	1.21	121	1.19	1.19
Water Absorption, 23°C/50% RH Water Absorption, Sat/23°C	ISO 62	0.63 6.0	0.54 4.0	0.44 5.0	0.60 2.2	0.46 2.0
Mold Shrinkage, mm/mm	ISO 294	0.001 – 0.004	0.002 – 0.005	0.002 – 0.005	0.002 – 0.006	0.002 – 0.005
Coefficient of Linear Thermal Expansion, mm/mm/°C, 0 – 50°C	ISO 11359-2	5.7	5.3	5.1	6.4	6.6

ACRYMID® and ACRYLITE® Heatresist

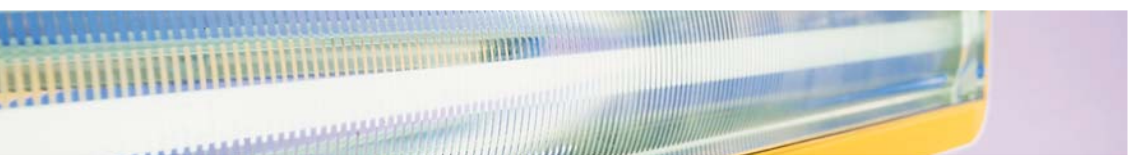
Processing Conditions – Injection Molding

Condition	ACRYMID 813	ACRYMID TT50	ACRYMID TT70	ACRYLITE Heatresist hw 55	ACRYLITE Heatresist FT15
Drying Temperature, °F	239	265	170	228	212
Melt Temperature, °F	482 – 536	482 – 536	500 – 555	428 – 482	428 – 482
Mold Temperature, °F	200	230	265	140 – 194	158 – 203
Injection Pressure, psi	6,000 – 15,000	6,000 – 15,000	6,000 – 15,000	6,000 – 15,000	6,000 – 15,000
Clamp Pressure 2.5 tons/in^2 of projected area for flow Length/wall thickness <100/1 5 tons/in^2 of projected area for flow Length/wall thickness >100/1					
Screw Speed, rpm 2:1 compression ratio 3.5:1 compression ratio	 75 – 150 60 – 130	 75 – 150 60 – 130	 75 – 150 60 – 130	 75 – 150 60 – 130	 75 – 150 60 – 130
Ram Speed, in/sec – small gates	0.5 – 1.5	0.5 – 1.5	0.5 – 1.5	0.5 – 1.5	0.5 – 1.5
Ram Speed, in/sec – large gates	1 – 4	1 – 4	1 – 4	1 – 4	1 – 4
Back Pressure, psi	25 – 100	25 – 100	25 – 100	50 – 150	50 – 150

Processing Conditions – Extrusion

Typical Screw Geometries and Machine Settings for Sheet Extrusion
(two stage screw with L/D of 30/1 assumed)

Screw Diameter	3 ½ inch	4 ½ inch	6 inch
Turns of Feed – Constant Depth	4 at 0.400	4 at 0.625	7 at 0.635
Turns of Transition – Constant Taper	3	3	3
Turns of Meter Pump – Constant Taper	5 at 0.165	5 at 0.180	4 at 0.190
Turns of Decompression – Constant Taper	1	1	1
Turns of Vent Zone – Constant Depth	4 at 0.650	4 at 0.750	at 0.750
Turns of Recompression – Constant Taper	2.5	2.5	2.0
Turns of 2nd Meter Pump – Constant Taper	5 at 0.280	5 at 0.305	5 at 0.320
Feed Zone	350 – 400	340 – 400	280 – 320
Rear	380 – 420	380 – 415	320 – 360
Rear Center	380 – 425	380 – 425	360 – 420
Center	390 – 430	380 – 425	400 – 440
Front Center	420 – 470	420 – 460	420 – 460
Front	430 – 475	420 – 460	420 – 460
Gate	450 – 470	450 – 470	460
Adapter	450 – 470	450 – 470	460
Die End Plates	450 – 470	450 – 470	470
Die Left and Right	440 – 470	440 – 470	460
Die Center	440 – 470	440 – 470	460
Approximate Output (lb/hr)	440 – 550	800 – 1000	1300 – 1800
Drive Horsepower	75 – 100	125 – 174	200 – 300



Material Considerations

Material Selection

- Selecting the right acrylic polymer for a particular application is an extremely important part of the design process.
- The first step is to clearly define the application and the end-use performance requirements for the molded part.
- Performance requirements include: weather resistance, heat resistance, toughness, and chemical resistance.
- Match the end-use performance requirements with the properties/attributes of potential materials. A grade with the highest strength and dimensional stability under heat will result in the most durable parts, although it may be more difficult to mold.

Chemical Resistance

- In practice, chemical resistance is dependent on:
  - molecular weight
  - internal and external stresses
  - degree of molecular orientation in the molded part
  - the specific chemical
  - presence and amount of impact modifier
- Acrylic polymers resist many chemicals found in normal use such as:
  - Ink
  - Alkaline solutions
  - Weak acids
  - Aliphatic hydrocarbons
  - Water and perspiration
  - Salt water
- Acrylic polymers are not resistant to most aromatic hydrocarbons.
- Plasticizers can attack ACRYLITE and ACRYLITE Resist acrylic polymers.
- Temperature can also affect the chemical resistance of acrylic polymers.
- As a result, we recommend that appropriate tests should be carried out in doubtful cases and technical advice be requested from us.

Outdoor Use

- A distinct advantage of ACRYLITE and ACRYLITE Resist polymers is their resistance to the adverse effects of weathering.
- ACRYLITE acrylic polymers maintain physical properties and optical properties for many years.
- ACRYLITE Resist polymers are also weather resistant and will retain both their physical properties and appearance after long periods of outdoor exposure.

Drying

- Acrylic polymers are slightly hygroscopic and require pre-drying.
- Recommended moisture levels:
  - Injection molding: 0.08% max
  - Extrusion: 0.03% max
- Use a desiccant type dryer
  - Drying time: 3 to 4 hrs
  - Effluent air: dew point of -20°F or lower
  - Small desiccant beads: 1/8" for more effective drying
  - Change desiccant periodically
- Acrylic polymers openly exposed to humid conditions can absorb up to 1.8% moisture
- Increase the drying time for high moisture containing polymer to 4 to 6 hours. Do not raise drying temperature.
- Insufficient drying can cause:
  - reduced transparency and increased haze
  - the appearance of surface streaks
  - bubbles throughout the part

Regrind

- Evonik's materials can all be reground and reprocessed without adversely affecting physical properties.
- The primary effect from using reground material is a shift in color.
- Use 25% regrind to 75% virgin material to minimize significant color change.
- Avoid contamination and remove all fines in the regrinding process.
- Regrind may require additional drying due to the increased surface to volume ratio.

Purging

- In most cases the acrylic polymer in an undried state is a sufficient purging compound.
- Commercial compounds that do not contain styrene or detergents such as ASA Clean, Dyna-Purge, and Ultimax are recommended.
- Acrylic polymers will discolor if left in the barrel too long (5 - 10 minutes).
- Material exposed to high temperatures for longer periods of time (i.e., overnight) will decompose and develop a skin on the screw barrel and nozzle.
- Decomposition will not cause any permanent machine damage and can be removed by purging with ground cast acrylic sheet.
- Prolonged interruptions, or when temperatures are unusually high (above 500°F), may lead to yellowing of material in the cylinder. If yellowing occurs, purging may be required.

Material Handling

- Molding of high quality transparent parts requires high quality handling processes to prevent contamination from external sources.
- The high surface hardness of acrylic also means it is abrasive in conveying systems.
- Stainless steel should be used for fixed conveying lines.
- Polyurethane hoses can be used for short, flexible hose runs.
- PVC should never be used as it softens and feeds particles of PVC into the conveying stream as it is abraded.
- Separators should be used to remove fines that are generated during the conveying process.

The Injection Mold

Basic Design

- The mold plates should be thick enough to prevent mold deformation that can occur from high melt pressures in the cavity.
- Slide molds can be used because the relatively viscous melt scarcely penetrates the gap between the sliding members.
- Acrylic polymers require 2.5 tons/in^2 (352 kg/cm^2) of projected area for flow length/wall thickness (L/t) <100/1 and 5 tons/in^2 (703 kg/cm^2) for L/t >100.
- Undercuts are not recommended.
- The mold cavity should have a smooth and nonporous surface, especially important when using crystal clear polymers.
- Chrome plating is preferred for a high gloss finish and to protect against penetration of lubricants into the mold surface.
- Molds for long runs should be case hardened and highly polished.
- To maintain reasonable residence times and minimize shear degradation, the shot size should range from 40 to 60% of the barrel capacity.
- If the cylinder is too large, difficulties in processing may occur because of long residence times or because of excessive stress on the machine drive.
- The choice of using a single-cavity versus a multi-cavity mold is dependent upon the capacity of the machine and the overall production economics.

Wall Thickness

- As a general rule, it is best to work with walls that are not excessively thin (< 0.039 in, 1 mm).
- Thin wall parts are more difficult to process and often deform at lower than expected temperatures due to increased molecular orientation.
- In order to adequately fill a thin wall part, a lower molecular weight compound with a higher melt flow rate should be used.
- Evonik Cyro offers grades of materials that are specifically suited for thin wall applications.

Mold Temperature

- The mold temperature has a significant influence on both the processing and properties of acrylics.
- A mold temperature control device is recommended.
- A cold mold is more difficult to fill and can lead to high cooling stresses, warping, strong orientation, and sink marks.
- A cold mold may also lead to a hazy surface appearance for parts molded from impact modified materials.

Venting

- Acrylic polymers tend to generate gases during processing requiring the mold to be vented.
- Venting serves two main purposes:
  1. Allows for displacement of the air in the mold so the polymer can fill the mold.
  2. Releases gases from the process resulting in a quality part free of dullness and poor finish.
- Use 0.0015" to 0.002" (0.040mm to 0.051mm) deep vents relieved to 0.005" for a length of 0.25 inches.
- For complex molds, vacuum venting should be considered.

Shrinkage

- Acrylic parts will shrink upon cooling.
- The amount of shrinkage is dependent upon the grade of acrylic, the processing conditions used, and the size and thickness of the part.
- Evonik's acrylics have a relatively low and predictable shrinkage in the range of 0.003 in/in to 0.008 in/in, depending on the particular grade.
- Mold design and process conditions should be taken into consideration when estimating the shrinkage.

Sprue

- The sprue must allow good filling of the mold cavity with a low pressure drop.
- The sprue should be as short as possible as flow resistance increases with sprue length.
- If the sprue is not seated directly on the mold, a cold slug well should be used opposite the sprue.
- The cold well will collect the cooler compound that emerges first from the nozzle.

Runners

- The best cross-section for a runner is full-round.
- Oval and rectangular cross-sections are not recommended.
- The runners should be kept as short as possible to facilitate complete and uniform filling.

Gating

- All types of gating designs have been used successfully with Evonik's line of acrylic polymer products.
- If the gate is too small it will restrict the filling speed which in turn prevents the adequate filling of the mold.
- When using a restricted gate, the diameter should not be less than 0.036 inch (0.9 mm) for articles of average weight and 0.028 inch (0.7 mm) for smaller articles with a uniform wall thickness.
- The tab gate is used in situations where the weak area around a restricted gate must be avoided. The wall of the tab should not be thicker than the wall of the part to avoid excessive cooling time.
- The fan gate is used for flat, thin moldings such as scales, covers, or rulers where one does not wish to inject on the large, flat faces.
- The umbrella gate is recommended for tubular articles.
- Submarine gating allows the molding to be automatically separated from the runner upon removal from the mold.
- Center gating was one of the first types of gates used in injection molding and is considered to be one of the best. It provides a balanced fill for the molded part which reduces stress and minimizes weld lines. Center gating requires adequate cooling around the gate area for hot runner molds.
- The gate should be located in a position of minimum mechanical stress as the gate has a notch effect and can induce failure.
- Refer to the ACRYLITE Technical User's Manual for a more detailed discussion regarding gating.

Extrusion

- There are many steps to follow in extrusion to ensure high quality product:
  - A clean dryer, conveying line, hopper, screw, barrel, and die
  - Maintain the proper melt temperature
  - Use microfinished, chromed, hardened dies and polishing rolls
  - Dry the material adequately
- A clean screw, barrel and die will tend to avoid contamination problems.
- It is very important to avoid contamination with other plastics as the extrusion behavior of the melt and the optical and mechanical properties of the finished extrudate can be seriously jeopardized.
- When the die temperatures are too high, a buildup will form on the die lips. This has been experienced with ACRYLITE Resist polymers.
- A die lip buildup can cause lines to form on the extrudate in the machine direction. On the other hand, if the die lip is too cool, the surface will be dull. Die lip edges must be very sharp to eliminate buildup.
- High quality polishing rolls are necessary to produce an excellent surface finish that is smooth and glossy.
- We recommend using microfinished, chromed, and hardened rolls to Rockwell C 50-60.
- The rolls should be equipped with accurate and independent temperature and speed controls, coupled to rubber pull rolls.
- Drying of the material is critical in extrusion. A moisture level at or below 0.03% is recommended to ensure that quality parts will be produced. Failure to adequately dry the material can result in a slight reduction in transparency and surface gloss, to severe surface streaks and/or bubbles.
- When using regrind, it is important to separate fines from the regrind. Failure to do this will result in black specs as the fines degrade and form char in the barrel which will slough off into the melt stream during processing.

Finishing and Post Treatment Options

Separation of the Sprue

- It is best to remove the sprue immediately after removal from the mold.
- Thin gates are cut with scissors, heated diagonal cutting pliers, or are broken off.
- Tab gates are usually removed with a small circular saw.
- Sprues are removed with cutters. The short, residual stump is sometimes faced on a milling machine.
- Umbrella-type gates and annular gates are usually trimmed off on a lathe.

Annealing

- Annealing minimizes the effects of internal stresses caused by the molding process.
- Annealing is recommended to avoid stress crazing if the molding may contact solvents or if the part will be solvent bonded or painted.
- The optimum annealing temperature is approximately 5°C below the distortion temperature under load (DTL).
- The annealing time is dictated by the thickness of the part.
- A rough guideline is one hour of heating per millimeter of material thickness and most importantly, one hour of cooling per millimeter of material thickness.
- The cooling time and rate are very important to the annealing process. If the molded parts are cooled too quickly, stresses may actually increase.

Antistatic Treatment

- The attraction of dust can be reduced by surface treatment with ionized air or liquid antistatic agents.
- Moldings can be immersed in this liquid immediately after removal from the mold.

Ethyl Acetate Test

- The ethyl acetate test aids in identifying internal stresses.
- The molding is immersed in ethyl acetate for two to three minutes. It is subsequently dried and examined for cracks and crazing.
- A properly molded part or annealed part will craze very little, and will, as a matter of experience, meet all practical requirements.
- Evonik Cyro's Technical Center can be contacted for a complete procedure.

Bonding

- There are a number of methods for bonding Evonik's line of acrylic polymer products.
  - Solvent bonding uses a solvent to soften the bonding area to the point where molecular entanglement between the two surfaces will occur.
  - When the solvent dissipates, the entanglement is frozen in place.
  - The bond strength is often as strong as the parent material.
  - Common solvents used for acrylics are methylene chloride, toluene, tetrahydrofuran, cellusolve, and methyl ethyl ketone.
- Adhesive bonding differs from solvent bonding in that the adhesive itself forms the bond.
  - Here, the bond is only as strong as the adhesive to the plastic substrate.
- Two-part epoxies, 100% solids UV curable, and cyanoacrylate adhesives are often used for acrylics.
- It is important to minimize molded-in stresses when any type of bonding will be performed on a part.
  - This can be achieved by following recommended processing conditions and/or annealing the part prior to bonding.
  - The Tech Brief entitled "Solvent and Adhesive Bonding" gives further recommendations for this process.

Regulatory Requirements

Evonik's clear products comply with the following Tripartite, USP and FDA regulations

Grade	Food Contact*1 (g/10 min)	USP Class VI*2	Tripartite*3
ACRYLITE 8N	Yes	Yes	Yes
ACRYLITE H15	Yes	Yes	Yes
ACRYLITE H12	Yes	Yes	Yes
ACRYLITE H12 MD	Yes	Yes	Yes
ACRYLITE M30	Yes	Yes	Yes
ACRYLITE M30 MD	Yes	Yes	Yes
ACRYLITE L40	Yes	Yes	Yes
ACRYLITE Heatresist hw55	Not Tested	Not Tested	Not Tested
ACRYLITE Satinice df23 8N	Not Tested	Not Tested	Not Tested
ACRYLITE Resist Zk 6	Yes	Not Tested	Not Tested
ACRYLITE Resist Zk 6SR	Not Tested	Not Tested	Not Tested
ACRYLITE Resist Zk-D	Yes	Not Tested	Not Tested
ACRYLITE Resist Zk X	Yes	Not Tested	Not Tested
ACRYLITE Resist Zk M	Yes	Not Tested	Not Tested
ACRYLITE Resist Zk F	Yes	Not Tested	Not Tested
ACRYLITE Resist Zk 5HG	Not Tested	Not Tested	Not Tested
ACRYLITE Resist Zk4 HR	Not Tested	Not Tested	Not Tested
ACRYLITE Resist Z3 HR	Not Tested	Not Tested	Not Tested
ACRYLITE Resist Zdf	Yes	Not Tested	Not Tested

*1 Products meet the requirements in 21CFR177.1010 for room temperature filled with 8% alcohol and for hot filled 150 °F with no alcohol.

*2 Class VI United States Pharmacopeia tests for determining the suitability of a plastic material intended for use in fabricating containers or accessories thereto, for parenteral preparations.

*3 Indicated products have been found to be non-hemolytic, non-cytotoxic, non-pyrogenic, non-sensitizing and non-mutagenic when tested following the Tripartite and ISO 10993-1 protocols.

Packaging

All Evonik acrylic polymer products are supplied as 1/8 inch cylindrical pellets. They are packaged in 375-lb drums, 1,500-lb cartons, or in bulk - via truck or railroad car.

Technical Support

Our TechKnowlogy Center at www.acrylite-polymers.com offers access to frequently asked questions, physical properties, processing conditions, regulatory compliance information, tips for trouble shooting and more. Evonik Cyro's Technical Service Center utilizes a broad range of extrusion, thermoforming, injection molding, and testing equipment for product and process evaluations. Our Technical Service Engineers are also available for on-site assistance in customer plants as needed. For technical information, please call +1 203 284-4290.

Evonik Cyro LLC
379 Interpace Parkway
Parsippany, NJ 07054
United States

PHONE +1 973 541-8000
+1 800 225-0172

cyro-polymer@evonik.com
www.acrylite-polymers.com
www.evonik.com

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