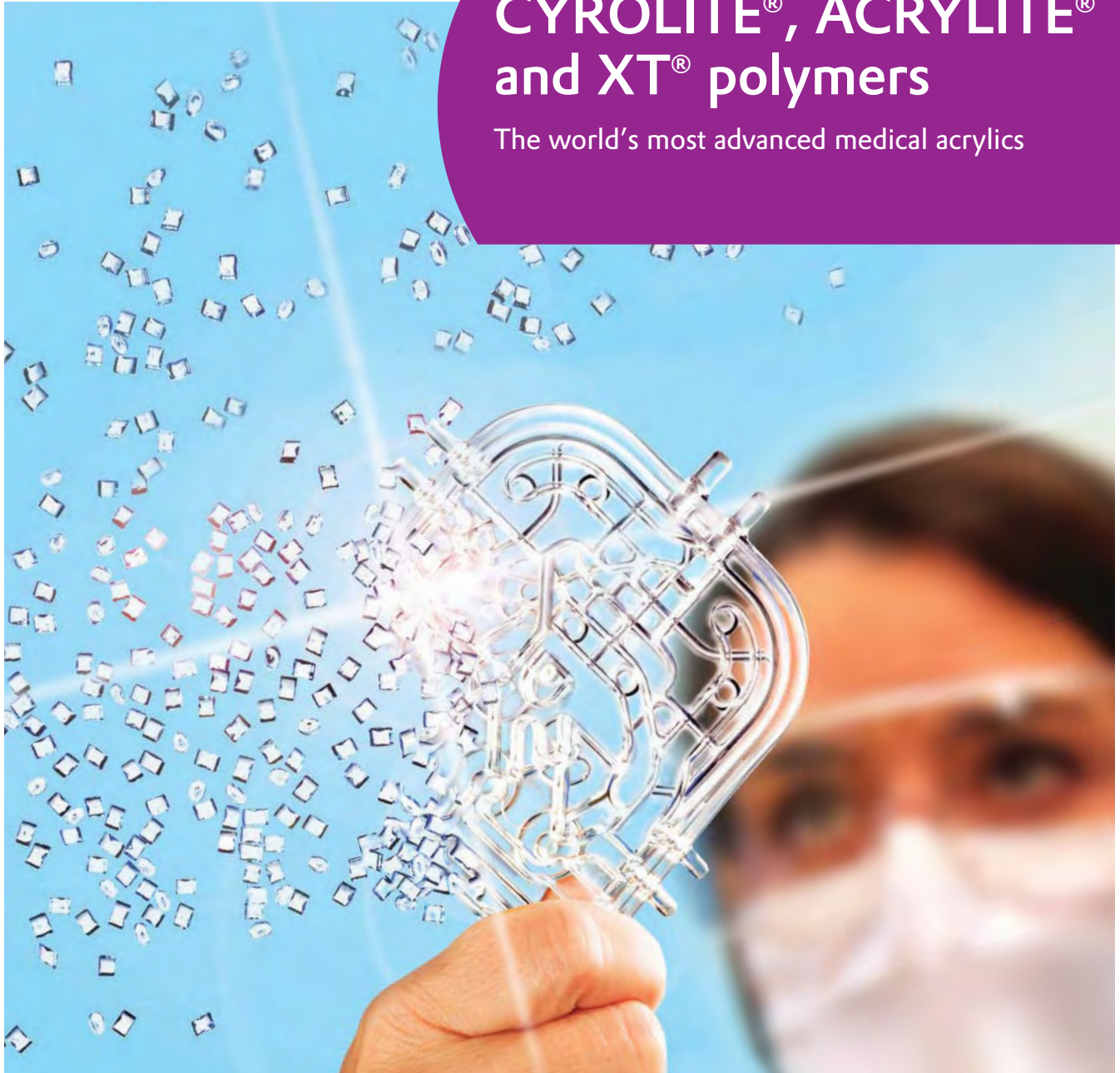


# CYROLITE<sup>®</sup>, ACRYLITE<sup>®</sup> and XT<sup>®</sup> polymers

The world's most advanced medical acrylics

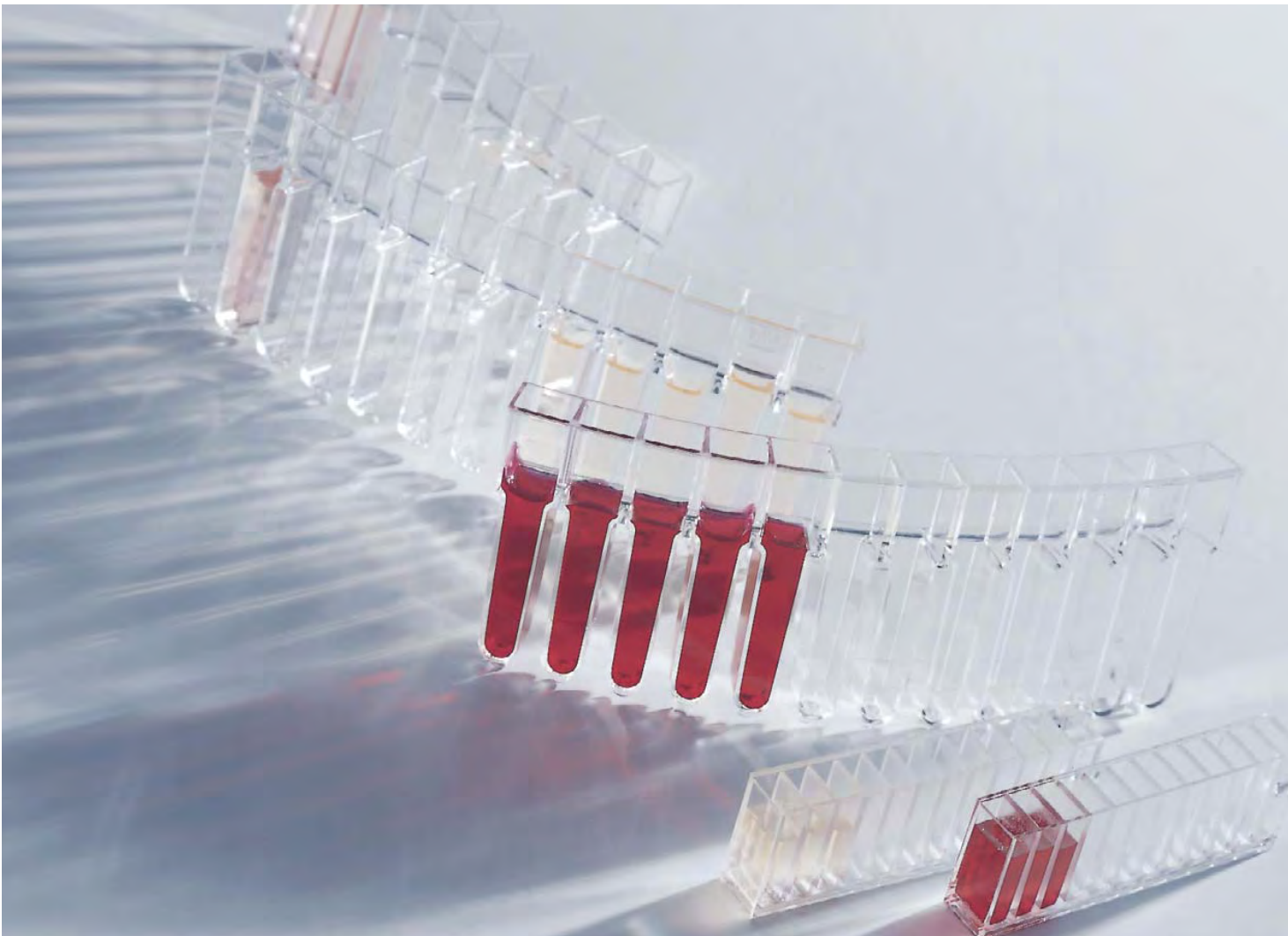


## Product Overview

Evonik offers a range of high-performance polymers and compounds for various medical device applications.

CYROLITE® and XT® polymer acrylic-based multipolymer compounds are transparent, impact-modified compounds that offer exceptional chemical resistance, high heat deflection temperature, outstanding impact strength, and simple processing.

ACRYLITE® MD™ acrylic polymer is a pure PMMA and ideal for medical diagnostic applications because it offers the highest optical clarity, transparency and UV transmission. ACRYLITE® MD™ is available in several grades including a high-flow grade, making it easy to process into thin-walled moldings or parts with complex designs.



# Applications



## **CYROLITE® applications**

- Luer locks
- Dialyzer housings
- Protection caps and covers
- Blood / plasma separators
- Collection and specimen vessels
- Connectors and injection ports
- Catheter accessories
- Chest drainage units
- Valve assemblies
- Meter housings
- Flow controls
- IV and lab filter housings
- Drip chambers
- IV adapters
- Yankauers
- Inhalation mouthpieces and spacers

## **XT® polymer applications**

Many applications similar to CYROLITE® that require high chemical resistance.

- Medical packaging competing with PETG
- Paper and soap dispenser housings
- Appliance housings
- Vacuum canisters
- Food packaging

## **ACRYLITE® MD™ applications**

- Diagnostic cuvettes
- Diagnostic test packs
- Optical sensor view ports
- Crystallography trays
- Microfluidics
- Rotors



# Key Properties

	ACRYLITE® MD™	CYROLITE® G-20	CYROLITE® G-20 HIFLO®	CYROLITE® GS-90	CYROLITE® CG-97	CYROLITE® Med 2	XT® polymer
Impact-modified		•	•	•	•	•	•
EtO-stable	•	•	•	•	•	•	•
Gamma / E-beam stable		•	•	•	•	•	• (in films only)
High flow	•		•	•	•		•
Superior gamma / E-beam stable				•	•		
Good chemical resistance		▪	•	•	•	•	•
Superior lipid resistance					•	•	
Superior lipid and alcohol resistance						•	

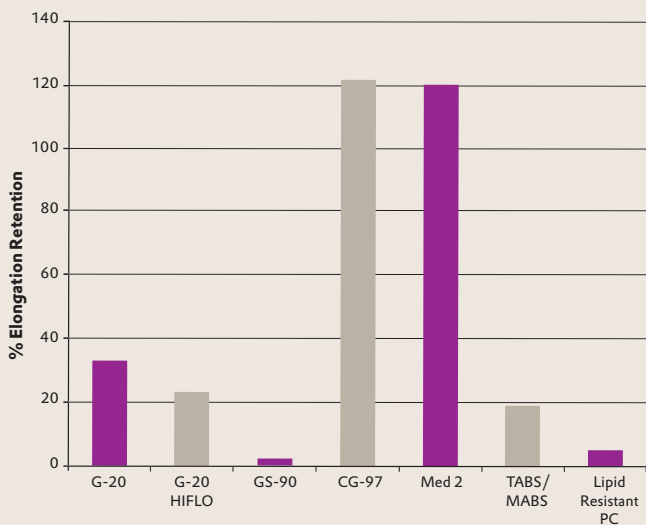


# Chemical Resistance

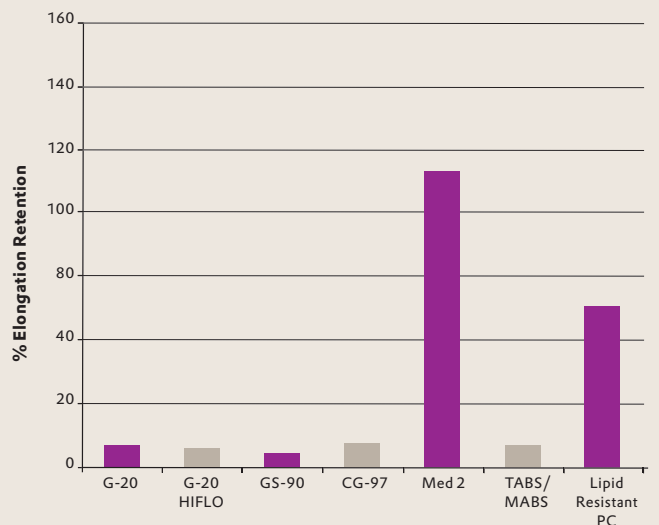


All Evonik medical polymers offer resistance to bodily fluids and many chemicals, especially plasticizers. However, for superior chemical resistance, including resistance to alcohol and lipids, CYROLITE® CG-97 and CYROLITE® Med 2 compounds are in a class of their own.

**Lipid Resistance at 1.2 % Strain, 20 Hours, 23° C**



**Alcohol (IPA) Resistance at 0.9 % Strain, 5 Hours, 23° C**



# Sterilization

Evonik high-performance polymers deliver the highest level of sterilization stability in the industry. All grades of CYROLITE® compounds are engineered for applications where gamma or E-beam sterilization is required, as they invariably demonstrate no loss in properties. Every grade offers unique characteristics and a variety of benefits.

Parts made from CYROLITE® G-20, CYROLITE® G-20 HIFLO®, and CYROLITE® Med 2 initially shift color upon irradiation. The color returns to near normal after four to five weeks.

CYROLITE® GS-90 and CYROLITE® CG-97 are designed specifically for gamma and E-beam sterilized products and may exhibit a very slight color change to a pleasing permanent blue-green tint after irradiation. Medical parts may, therefore, be immediately sent to market after sterilization.

Parts made from XT polymer are suitable for EtO sterilization. A color shift occurs upon gamma and E-beam sterilization. Thin walled parts and films only show a very slight color shift.

## Sterilization Methods

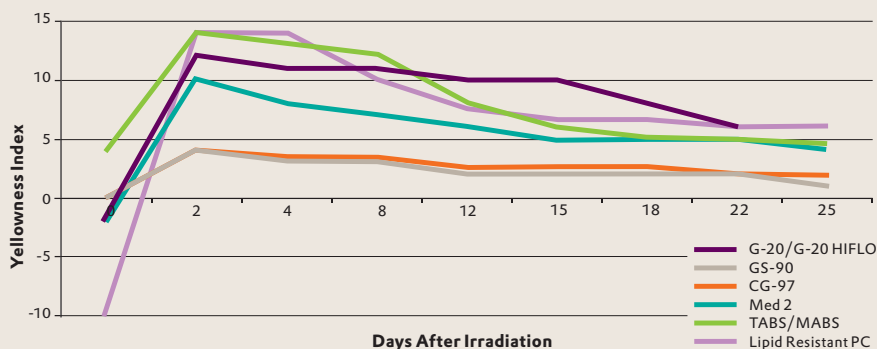
	ACRYLITE® MD™	CYROLITE® G-20	CYROLITE® G-20 HIFLO®	CYROLITE® GS-90	CYROLITE® CG-97	CYROLITE® Med 2	XT® polymer
EtO-Gas	●	●	●	●	●	●	●
Gamma		●	●	●●	●●	●	● (in films only)
E-beam		●	●	●●	●●	●	● (in films only)
Steam							

### Key:

Good ●

Exceptional ●●

Effects of Gamma Irradiation on Yellowness Index (2.5 Mrads / 25 kGy)



# Properties

## Bondability

CYROLITE® and XT® polymer acrylic-based multipolymer compounds offer excellent and consistent bonding to PVC tubing and other compatible plastics and are superior to ABS or similar materials. Parts can be solvent or thermal-bonded.

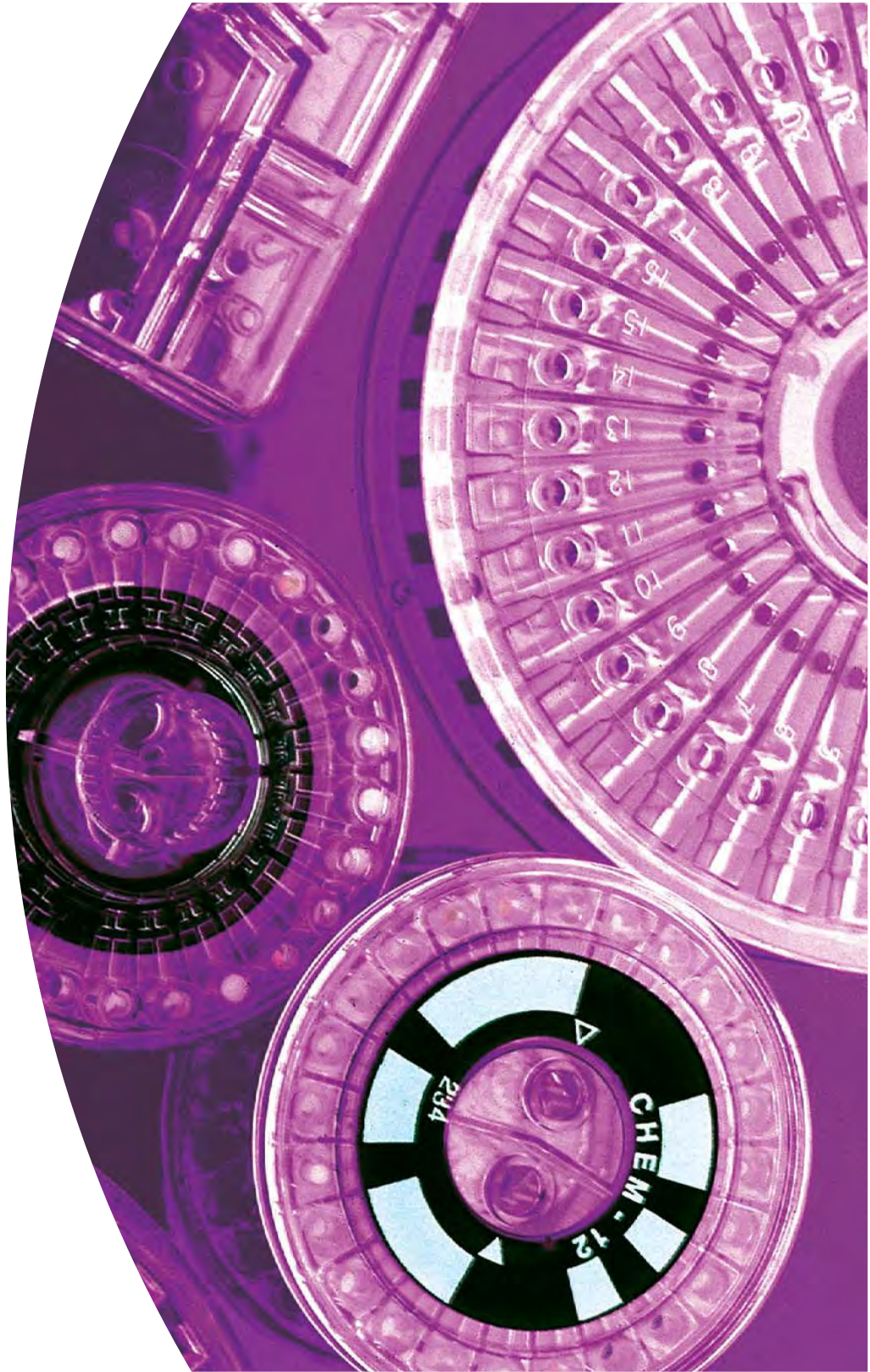
Typical bonding solvents are: cyclohexanone (excellent for bonding vinyl), tetrahydrofuran, methyl methacrylate monomer, methyl ethyl ketone and toluene. Cyanoacrylate and UV-curable adhesives are also recommended. It is important to remember that all solvents should be tested for suitability and applicability and should be handled only by qualified persons familiar with their potential hazards.

## Welding

Evonik medical polymers can be readily welded using high frequency, ultrasonic, vibration, spin or hot plate welding.

## Optical properties

Transparent Evonik medical polymers offer high light transmission with little haze. They can be easily pigmented or dyed to provide a wide variety of transparent and opaque colors.



# Medical Diagnostics

ACRYLITE® MD™ acrylic polymers are available in two grades that vary according to processing conditions and are well suited for diagnostic applications.

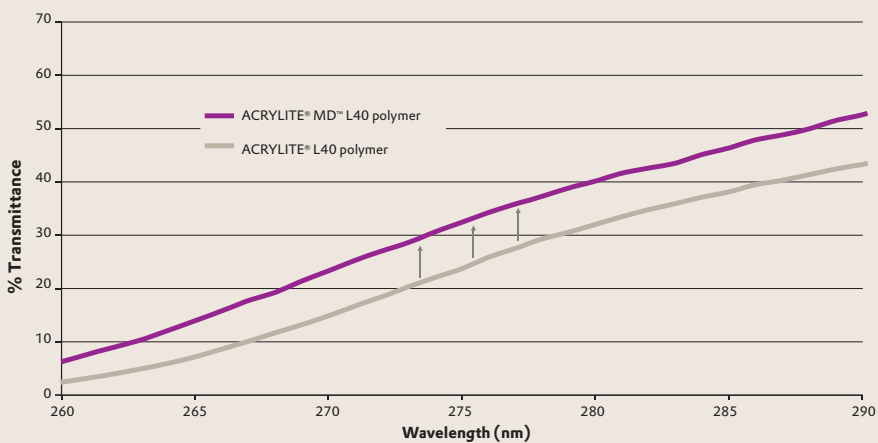
ACRYLITE® MD™ L40 has been found to be non-hemolytic, non-cytotoxic, non-pyrogenic, non-sensitizing, and non-mutagenic.

Performance formulations offer:

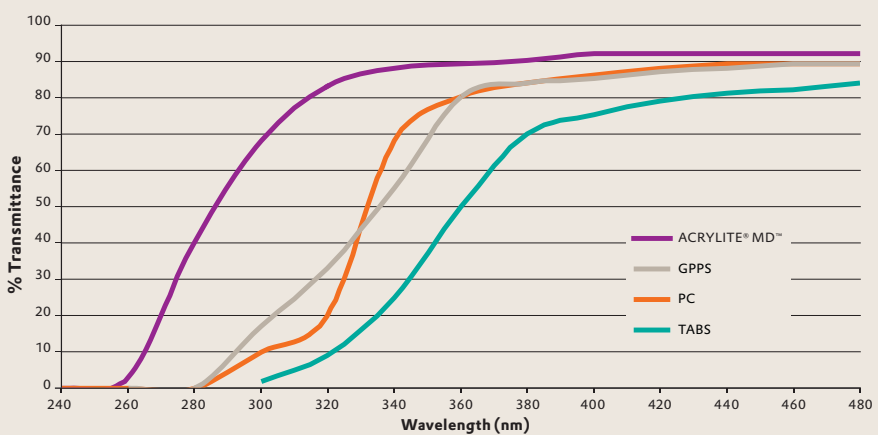
- Exceptional ultra-violet light transmittance
- Excellent optical clarity
- Maximum flow characteristics
- Good dimensional stability
- Regulatory compliance for quality control
- Total cost-of-use advantage over glass

Produced to the rigorous standards of production quality control for UV transmittance, ACRYLITE® MD™ polymers offer 87.7% light transmittance at 340 nm critical to insuring consistent measurement response. Along with UV transmittance, ACRYLITE® MD™ polymers offer excellent transparency and cleanliness for maximum visible inspection capabilities exceeding that of other polymers and standard acrylic.

**ACRYLITE® MD™ polymer — Proven UV Transmission Improvement**



**ACRYLITE® MD™ polymer vs. Competitive Materials**



# Processability

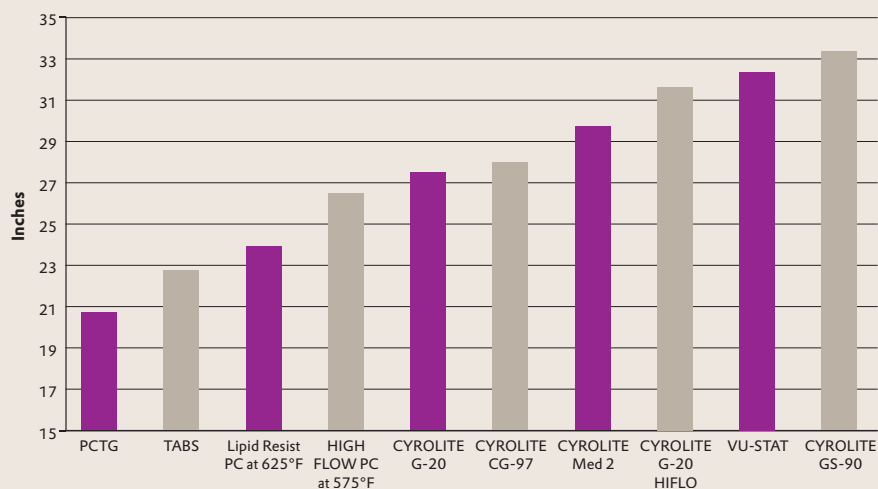


Evonik medical polymers are easy to injection mold and are readily adaptable to tooling designed for comparable plastics like styrene, vinyl, ABS and polycarbonate. The cycle time in injection molding is excellent, and the regrind can be readily used.

All grades offer exceptional ease of processing. CYROLITE® Med 2 and CYROLITE® G-20 HIFLO® compounds show particularly good flow. In addition, CYROLITE® GS-90 compound offers excellent processability at low temperatures, and its high flow, as measured by the spiral flow test, is perfect for extremely thin-walled applications and complex multicavity molds.

Additional specialty medical grades available from Evonik are CYREX® acrylic-polycarbonate alloys and Vu-Stat® static dissipative acrylic multipolymer compounds.

**Spiral Flow (In) 0.125' Depth, Melt at 450°F, Mold at 105°F**



## Processing Recommendations for Injection Molding

	ACRYLITE® MD™	CYROLITE® G-20	CYROLITE® G-20 HIFLO®	CYROLITE® GS-90	CYROLITE® CG-97	CYROLITE® Med 2	XT® polymer
Drying Temperature °F (°C)	160 (71)	175 (80)	175 (80)	160 (71)	160 (71)	160 (71)	180 (82)
Melt Temperature °F (°C)	410 – 470 (210 – 243)	400 – 475 (204 – 246)	380 – 460 (193 – 238)	410 – 470 (210 – 243)	420 – 480 (215 – 249)	420 – 480 (215 – 249)	400 – 475 (204 – 246)
Cylinder Temperature °F (°C)	410 – 470 (210 – 243)	380 – 460 (193 – 238)	360 – 460 (182 – 238)	375 – 450 (190 – 232)	410 – 480 (210 – 249)	425 – 480 (218 – 249)	400 – 475 (204 – 246)
Mold Temperature °F (°C)	80 – 160 (25 – 71)	120 – 180 (49 – 82)	120 – 180 (49 – 82)	120 – 180 (49 – 82)	120 – 180 (49 – 82)	120 – 180 (49 – 82)	120 – 170 (49 – 77)

**Note:** Drying time for ACRYLITE MD, XT polymer, and all CYROLITE grades is three – four hours. The optimal melt temperature is the lowest temperature at which the mold is completely filled. For best clarity, use a hot tool with good cooling and temperature control.

# Regulatory Compliance

Evonik products comply with the following Tripartite, ISO 10993-1, USP, and FDA regulations. All medical grades below comply with RoHS requirements, REACH requirements Dec. 2008, are free of REACH-SVHC substances, and are DEHP, Mercury, Latex and BPA free.

## Regulatory requirements

	ACRYLITE® MD™ L40	CYROLITE® G-20	CYROLITE® G-20 HIFLO®	CYROLITE® GS-90	CYROLITE® CG-97	CYROLITE® Med 2	XT® polymer
Food contact <sup>1</sup>	•	•	•	•	•	•	•
USP Class VI <sup>2</sup>	•	•	•	•	•	•	• <sup>4</sup>
ISO 10993-1 (Tripartite) <sup>3</sup>	•	•	•	•	•	•	• <sup>4</sup> (8RG grade not tested)

**Notes:**

<sup>1</sup> Products meet FDA food contact requirements of 21CFR177.1010 and 21CFR180.22, as appropriate to the specific product and use.

<sup>2</sup> Class VI United States Pharmacopoeia tests for determining the suitability of a plastic material intended for use in fabricating containers or accessories thereto, for parenteral preparations.

<sup>3</sup> 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.

<sup>4</sup> In natural and 301 tints only. Others colors not tested.

# Technical Support

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 available for on-site assistance in customer plants as needed.

Visit our TechKnowlogy Center at [www.acrylite-polymers.com](http://www.acrylite-polymers.com) to access frequently asked questions, physical properties, processing conditions, regulatory compliance information, tips for trouble shooting and more.



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**Evonik. Power to create.**