

Ready for a  
new perspective?

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# High Performance Plastics

for optical  
applications





CONTENT	
Introduction	3
Product overview	4
Solutions for frames	6
Solutions for lenses	16
Solutions for coatings	20
Ecology and safety	22
Service	24

Evonik's High Performance Polymers Business Line produces customized products, systems, and semi-finished goods based on high-performance polymers. For over 40 years, our plastics have been proving their worth in the automotive, communications and electrical engineering industries, in the sports world, and in medical technology. We have established a presence in the field of optics with our unique tailor-made polymers. The most common used transparent polymers are market under the TROGAMID® brand.

We assist you along the lifecycle of your product, from the initial product idea up to mass production. Accept our invitation to benefit from our expertise in various technical fields like surface technology, process technology, polymer design and compounding. Identify and commercialize the most attractive and innovative new products in partnership with Evonik High Performance Polymers.

To speed up your time-to-market for your product, we offer a full line of services: cooperative product development, chemical and physical analytical testing, global on-site support for planning

your production processes, product trials in our technical centers in Germany, USA and China.

After product launch, take advantage of our production and warehouse locations as well as our expertise in global supply chain management and on-site production maintenance support. These services in conjunction with our top quality products will further improve your selling position and the profitability of your business. We manufacture our products – your raw materials – in highly advanced plants under strict quality guidelines that are certified according to ISO 9001:2008.



## Solutions for frames

We offer a wide range of materials with high transparent, translucent and non-transparent characteristics. Our materials are easy to process and to color with no limits in design. To gain the maximum freedom of design, you can use this toolbox of material properties like:

- bio-based
- bendable
- stiff
- filigree
- soft
- skin friendly
- transparent
- glossy

## Solutions for lenses

TROGAMID® CX nylons feature excellent, permanent, crystal-clear transparency and outstanding optical properties, in spite of their micro-crystalline character. No other lens material for sunglasses and sports glasses boasts this combination of out-standing properties.

Thanks to their unique properties TROGAMID® CX nylons allow very efficient production of eyeglass lenses that can be combined with any frame material. Special product modifications with, for example, stabilizers, absorbers, or colors are available on request.



# PRODUCT OVERVIEW

## OUR TOOLBOX

### SOLUTIONS FOR FRAMES

→ Bio-based

→ Bendable

→ Stiff

→ Filigree

→ Soft

→ Skin friendly

→ Transparent

→ Glossy

### SOLUTIONS FOR LENSES

→ Gradient tinted

→ Standard

### SOLUTIONS FOR COATINGS

→ Pol film

→ Anti-scratch

→ Anti-mist

→ UV cut

## Solutions for coatings

Lenses made from TROGAMID® CX, a grade developed specifically for optics, offer:

- the highest degree of comfort, because they are ultralight
- high durability because of their excellent mechanical properties
- the highest possible reliability because of their excellent resistance to stress cracking and breaking
- crystal clear pictures because of the high Abbe value

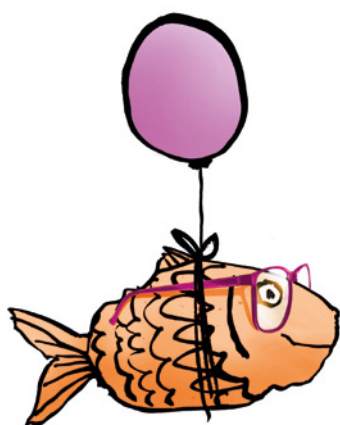
As your partner we understand the optical market as a complete process chain, besides our materials for frames and lenses. Therefore we offer following solutions like:

- Materials for UV-protection
- Pol films for contrast enriched view
- Proofed coating chemicals and processes with different systems

# Solutions for frames

## TROGAMID® T5000

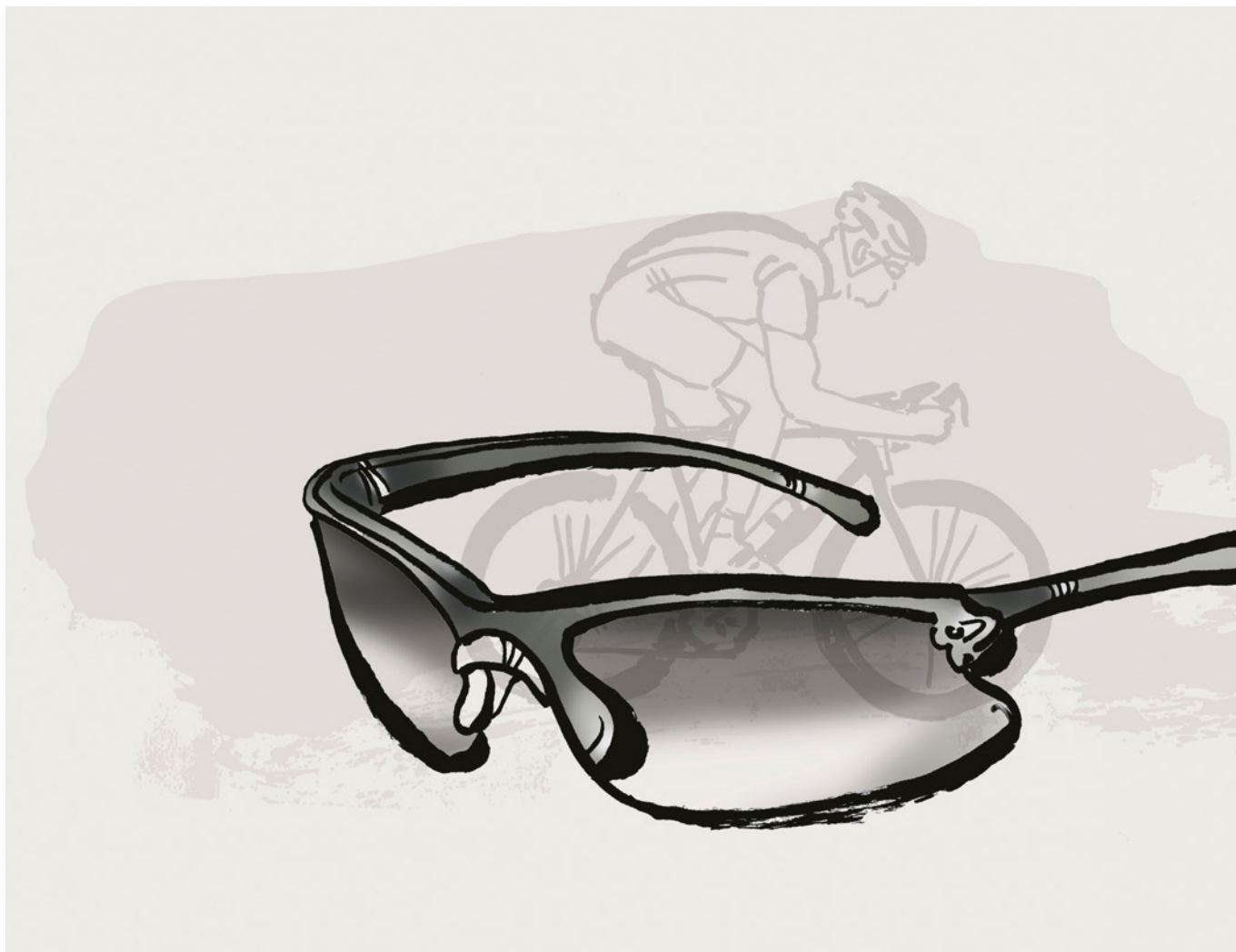
Transparent, amorphous  
long chain nylon for  
high stiff frames for sport,  
sun and reading glasses



### TROGAMID® T5000

TROGAMID® T5000, an amorphous nylon with a transparency of 90%, is an ideal material for optical manufacturers. Compared to other transparent nylons, TROGAMID® T5000 offers higher modulus and rigidity. Moreover, the material is particularly suitable for manufacturing thin frames and semi-rimless eye wear frames, which can significantly reduce the frame weight without affecting performance. This in turn greatly improves wearing comfort.

TROGAMID® T5000



While consumers tended to focus on aesthetics in the past, they now place greater emphasis on product quality and performance. Optical manufacturers carefully consider material properties for their choices. TROGAMID® T5000 is characterized by its outstanding chemical resistance, which prevents cracking from contact with chemicals. Furthermore, the material's easy processing and coloring properties save time and money for maximum efficiency.

### Key features

- Filigree, given by:
  - very high elastic modulus
  - flow ability
- Ultra-strong, given by:
  - high elastic modulus
  - high fatigue resistance
- Lightweight, given by:
  - toughness
  - low density
- Easy to design, given by:
  - amorphous and smooth surface
  - 90% transparency
- Less yellow stitch compared to other competitive materials

### Product offering

TROGAMID® T5000 is supplied as spherical pellets in moisture-proof packaging, ready for processing.

### Typical applications

- Frames in sport
- Sun and reading glasses

# TROGAMID® CX9704

Transparent,  
amorphous nylon for  
frames in sunglasses



## TROGAMID® CX9704

TROGAMID® CX9704 is an amorphous and transparent nylon for the manufacture of frames according to the injection molding procedure. Due to the amorphous character, the frames can be easily colored or tinted. The low shrinkage performance gives freedom of design.

## Key features

- Filigree, given by:
  - high elastic modulus
  - flow ability
- Light colors, given by:
  - no yellow stitches
  - > 90% transparency
- Ultra-strong, given by:
  - high fatigue resistance
- Lightweight, given by:
  - 1,02 grams/qcm density
- Easy to clean, given by:
  - smooth surface
  - chemical resistance
- Permanently transparent
- Low water absorption

## Product offering

TROGAMID® CX9704 is supplied as spherical pellets in moisture-proof packaging, ready for processing.

## Typical applications

- Frames in sunglasses



# TROGAMID® CX7323

Transparent and micro-crystalline nylon for filigree and fatigue resistance frames of sport glasses



## TROGAMID® CX7323

TROGAMID® CX7323 is a microcrystalline and transparent nylon for the manufacturing of parts in the optical industry, e.g. lenses by injection molding. The product has been approved for direct contact with foodstuffs by the European Community (Directive 10/2011/EC according 1935/2004 and FDA according to Food Contact Notification FCN-no. 1895).

The material appears transparent to the human eye because the crystallites are so small, that they do not scatter visible light. The crystalline structure causes the excellent crack and chemical resistance for this polymer.

## Key features

- Filigree, given by:
  - high elastic modulus
  - flow ability
- Light colors, given by:
  - no yellow stitches
  - > 90% transparency
- Ultra-strong, given by:
  - high fatigue resistance
  - high impact resistance
- Easy to clean, given by:
  - microcrystalline
  - smooth surface
- Medium viscous
- Permanently transparent

## Product offering

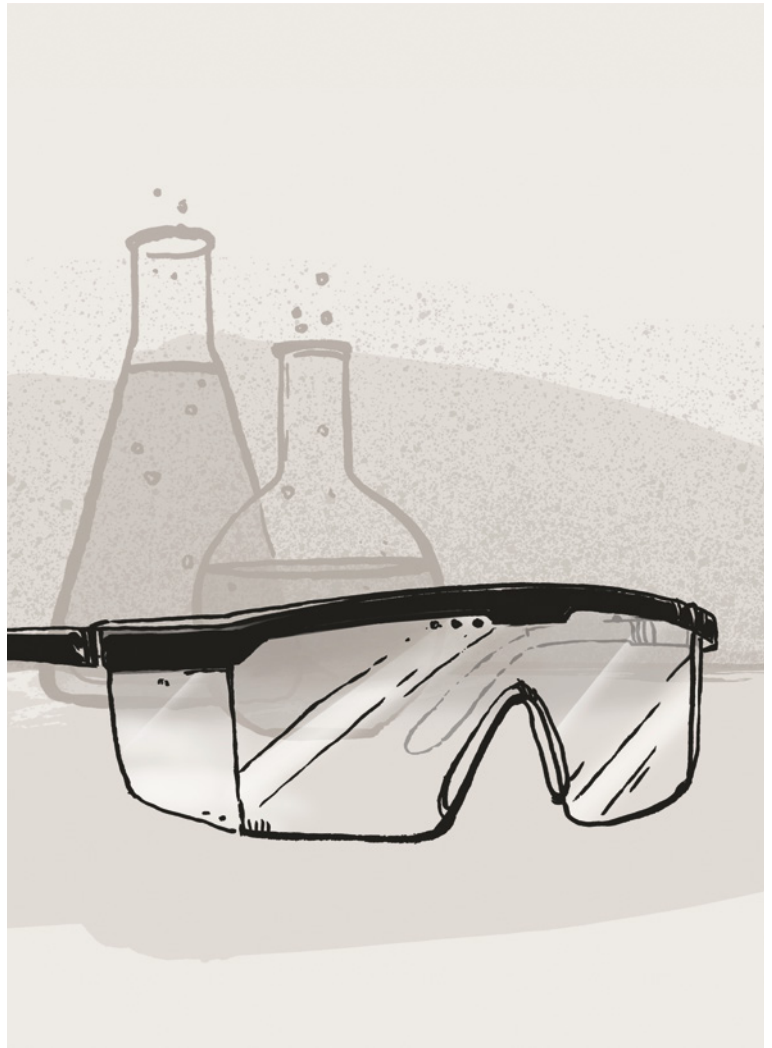
TROGAMID® CX7323 is supplied as spherical pellets in moisture-proof packaging, ready for processing.

## Typical applications

- Filigree and fatigue resistance frames
- Impact demanding sport frames

# TROGAMID® CX impact

Microcrystalline long chain nylon with plasticizer for safety glasses and sport articles



## TROGAMID® CX impact

TROGAMID® CX impact is an impact modified non transparent nylon for the manufacture of parts according the injection molding procedure.

## Key features

- Middle viscosity
- Impact modified
- Transparent nylon

## Product offering

TROGAMID® CX impact is supplied as pellets in polyethylene packaging, ready for processing.

## Typical applications

- Safety glasses
- Sport articles

# VESTAMID® Terra

Semi-crystalline nylon,  
100% bio-based for frames  
with the highest possible  
bio-content



## VESTAMID® Terra

VESTAMID® Terra is semi-crystalline, it's the reason for its high mechanical resistance and chemical stability. It absorbs little water and as a result its mechanical properties and high dimensional stability change little when exposed to fluctuating environmental humidity.

VESTAMID® Terra is based on polyamide 1010 and is the polycondensation product of 1,10-decamethylene diamine (D) and 1,10-decanedioic acid (sebacic acid—S). Because both monomers are extracted from castor oil, VESTAMID® Terra is a material that is based on 100% natural resources.

## Key features

- Based on 100% natural resources
- High mechanical resistance
- High chemical stability
- High melting point

## Product offering

VESTAMID® Terra is supplied as pellets in polyethylene packaging, ready for processing.

## Typical applications

- Frames with the highest possible bio content

# VESTAMID® Care ME

Semi-crystalline,  
elastomer for kids glasses  
and soft parts in sport  
glasses



## VESTAMID® Care ME

VESTAMID® Care ME standard grades have a proven history in medical applications.

The biocompatibility of VESTAMID® Care ME grades has been tested for following recommendations of ISO 10993-10 for no skin irritations.

## Key features

- High flexibility and elasticity
- Good rebound properties
- High impact resistance
- Excellent dimensional stability
- High chemical resistance
- Easy processability and colorability
- Tough and resilient
- Low density
- No skin irritation

## Product offering

VESTAMID® Care ME is supplied as spherical pellets in moisture-proof packaging, ready for processing.

## Typical applications

- Kids glasses
- Soft parts in sport glasses

# VESTAKEEP®

Semi-crystalline, PEEK  
medium and high flow  
for premium frames for  
reading glasses



## VESTAKEEP®

VESTAKEEP® 4000G/2000G is a medium/high flow viscosity, unreinforced polyether ether ketone for injection molding. The semi-crystalline polymer features superior, thermal and chemical resistance. VESTAKEEP® is a high-end material and was developed for the aircraft industry. VESTAKEEP® can be processed by common machines for thermoplastics.

## Key features

- Filigree, given by:
  - ultra high elastic modulus
  - flow ability
- Ultra-strong, given by:
  - high elastic modulus
  - high fatigue resistance
- Lightweight, given by:
  - toughness
  - low density
- Easy to clean, given by:
  - good chemical resistance
  - hydrophobic surface

## Product offering

VESTAKEEP® is supplied as cylindrical pellets in moisture-proof polyethylene liners, ready for processing. VESTAKEEP® 4000G is also available in black color.

## Typical applications

- Premium frames for reading glasses



# PROPERTIES

	Unit	Test method
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Density		g/cm <sup>3</sup>	ISO 1183
Transmittance	2 mm	%	ASTM D 1003
Haze	2 mm	%	ASTM D 1003

## Refractive index

Mold shrinkage (MD, TD)	in flow direction	%	ISO 294
Melt: 280 °C, mold: 80 °C	in transverse direction	%	ISO 294

## Water absorption

Saturation	%	ISO 62
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## CHARPY impact strength

23 °C	kJ/m <sup>2</sup>	ISO 179/1eU
-30 °C	kJ/m <sup>2</sup>	ISO 179/1eU

## CHARPY notched impact strength

23 °C	kJ/m <sup>2</sup>	ISO 179/1eA
-30 °C	kJ/m <sup>2</sup>	ISO 179/1eA

## Tensile test

Stress at yield	50 mm/min	MPa	ISO 527/1A
Strain at yield	50 mm/min	%	ISO 527/1A
Nominal strain at break	50 mm/min	%	ISO 527/1A
Tensile modulus	1 mm/min	MPa	ISO 527/1A

## Differential scanning calorimetry (DSC)

Glass transition temperature T <sub>g</sub>	°C	ISO 11357
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TROGAMID®  
T5000

TROGAMID®  
CX9704

1.12	1.02
91	92
0.4	2

0.5	0.5
0.6	0.6

7.5	3.5
-----	-----

N	N
N	N

10	10
7	10

90	60
8	8
>50	>50
2800	1400

150	132
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Solutions for **frames**



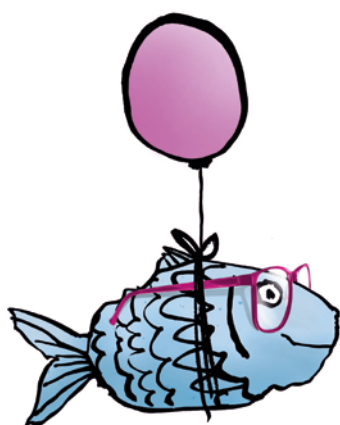
TROGAMID® CX7323	TROGAMID® CX impact	VESTAMID® Terra DS16	VESTAMID® Care ME26	VESTAKEEP® 2000G
1.02	1.02	1.05	1.0	1.3
92	53	39		
2.1	81	39		
0.7	0.74	1.6		1.1*
0.8	0.87	1.5	0.7	1.1*
3.5	3.5	1.8		0.5
N	N	N	N	N
N	N	N	N	N
11	45	7	N	6
11	34	7	N	6
60	40	54		100
8	8	5		5
175	>50	>50	>500	30
1400	1070	1700	22	3700
140	135	37		

\*Melt: 360 °C, mold: 180 °C

# Solutions for lenses

## TROGAMID® myCX high flow

High flow for premium  
gradient tinted lenses



### TROGAMID® myCX series

TROGAMID® myCX high flow is a microcrystalline transparent nylon for the manufacture of parts in the optical industry, e.g. lenses by the injection molding. The material appears transparent to the human eye because the crystallites are so small, that they do not scatter visible light. The crystalline structure causes the excellent crack resistance for this polymer.

TROGAMID® myCX series



The product has been approved for direct contact with foodstuffs by the European Community (Directive 10/2011/EC according 1935/2004 and FDA according to Food Contact Notification FCN-no. 1895). Besides the TROGAMID® myCX high flow, we offer with our TROGAMID® CX9711 a material with an ultra-high flow property for visors or thin optical parts, which require a high flow length performance.

#### Key features

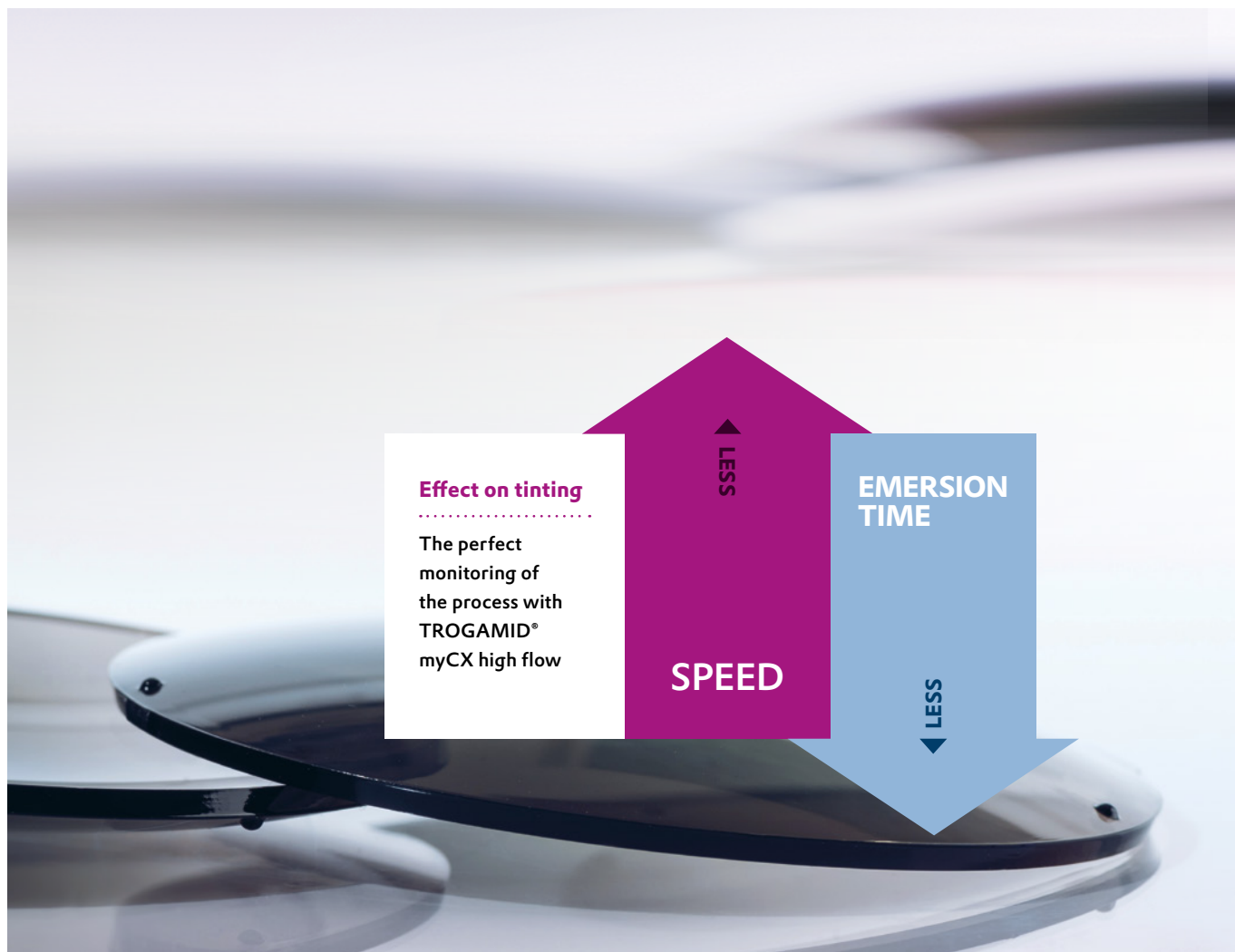
- Durable
- Lightweight
- Superior stress cracking resistance
- Chemical resistance
- Ultra strong
- High Abbe value

#### Product offering

TROGAMID® myCX high flow and TROGAMID® CX9711 are supplied as spherical pellets in moisture proof polyethylene-packaging, ready for processing.

#### Typical applications

- Gradient tinted lenses
- Visors



### Comparison of key properties

	Unit	TROGAMID® myCX high flow	TROGAMID® CX9711
Density	g/m <sup>2</sup>	1.02	1.02
Transmittance	%	92	92
Haze 2 mm		2.1	2.1
Flow spiral		++	+++
Yield rate		very high	high

TROGAMID® myCX series

Solutions for lenses



# PROPERTIES



**TROGAMID®  
myCX high flow**

**TROGAMID®  
CX9711**

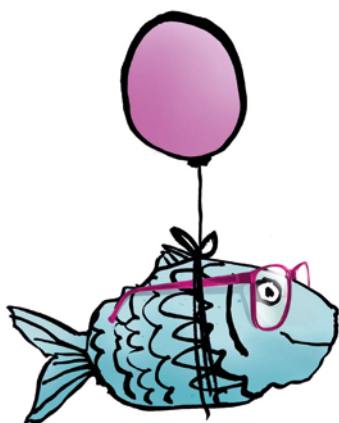
		Unit	Test method
Density		g/cm <sup>3</sup>	ISO 1183
Transmittance	2 mm	%	ASTM D 1003
Haze	2 mm	%	ASTM D 1003
<b>Refractive index</b>			
Mold shrinkage (MD, TD)	in flow direction	%	ISO 294
Melt: 280 °C, mold: 80 °C	in transverse direction	%	ISO 294
<b>Water absorption</b>			
Saturation		%	ISO 62
<b>CHARPY impact strength</b>			
23 °C		kJ/m <sup>2</sup>	ISO 179/1eU
-30 °C		kJ/m <sup>2</sup>	ISO 179/1eU
<b>CHARPY notched impact strength</b>			
23 °C		kJ/m <sup>2</sup>	ISO 179/1eA
-30 °C		kJ/m <sup>2</sup>	ISO 179/1eA
<b>Tensile test</b>			
Stress at yield	50 mm/min	MPa	ISO 527/1A
Strain at yield	50 mm/min	%	ISO 527/1A
Nominal strain at break	50 mm/min	%	ISO 527/1A
Tensile modulus	1 mm/min	MPa	ISO 527/1A
<b>Differential scanning calorimetry (DSC)</b>			
Glass transition temperature T <sub>G</sub>		°C	ISO 11357

1.02	1.02
92	92
2.1	1.5
0.7	0.5
0.72	0.5
3.5	3.5
N	N
N	N
10	11
10	10
59	60
8	8
>50	157
1480	1400
137	132

**TROGAMID® myCX series**

Solutions for **lenses**

# Solutions for coatings



## UV-protection\*

### TROGAMID® CX7323 and TROGAMID® myCX systems

- TROGAMID® CX 1000  
UV masterbatch
- TROGAMID® CX

\* UV-cut off

Solutions for **coatings**



## Pol film solutions

### **TROGAMID® CX base pol films**

- Chemical resistance
- Very good bonding to  
TROGAMID® CX lenses

## Coatings

### **Solutions for coatings via partners**


- Close contact to coating companies  
for best customer support.
- Proofed chemicals and processes  
with different systems which work  
especially with our TROGAMID®  
myCX high flow.

**ECOLOGY**

**AND SAFETY**







TROGAMID® resins are non-hazardous substances that are not governed by any particular safety regulations. TROGAMID® CX resins are classified under Water Hazard Class 0. They can be disposed of in landfills or incinerated as normal household waste in accordance with local ordinances. Further information can be obtained from the TROGAMID® CX material safety data sheets that we send upon request.

Recycling is, however, preferred and advisable for economic reasons. How reclaimed materials affect the functional properties of a molded part has to be judged in each individual case. Further information about the use of regrind can be obtained from the indicated contacts.

No dangerous by-products are formed if TROGAMID® CX is processed correctly. Care should be taken, however, to ventilate the working area properly.

TROGAMID® resins contain no halogenated flame retardants, e.g., brominated biphenyls or diphenyl-ethers. No pigments or additives containing cadmium are used.

If the melt is discolored or black specks appear, this is a sign that the material has degraded during processing. Degraded material should be removed quickly from the machine and cooled under water to minimize any offensive odors or fumes. At higher temperatures, most TROGAMID® CX resins will burn. From melt temperatures 360°C/370°C, flammable gases are released. Combustion with a sufficient supply of air produces carbon monoxide, carbon dioxide, water, and nitrogen containing compounds as end products. Since the crack and combustion spectrum depends to a great extent on the combustion conditions, it is not possible to make any general statement here.



**WE HAVE THE RIGHT MATERIALS**

**TO TAKE YOU TO THE TOP!**



## Processing

### The right service on site

- Selection of the right grade
- Support with CAE- and Moldflowanalysis
- Assistance at trials and prototyping
- Global technical team for your back up

## Plastics Database

### The new material database containing all products of Evonik High Performance Polymers

Our new material database contains important information on plastic raw materials available from Evonik High Performance Polymers. From a given specific profile it is possible to preselect materials suitable to your application from a multitude of grades. The properties of the thermoplastic raw material are based on ISO-Standard and, therefore are interchangeable.

- You can find our Database at:  
**[www.plastics-database.com](http://www.plastics-database.com)**



Our  
services

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ONL

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