

Ready for a
new perspective?

.....

High Performance Plastics

for optical
applications





WORKING TOGETHER FOR SUSTAINABLE TRANSFORM IN OPTICS

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ATION

Together, we are driving sustainable transformation of the industry

For more than 50 years, the plastics of Evonik's High Performance Polymers Business Line have been proving their worth in various industries. Now we are taking the next step towards more sustainable production. One of our focus areas is the use of alternative feedstocks and renewable energy to save fossil resources.

In optics we have established a presence with our unique customized polymers, especially with the transparent nylons marketed under the TROGAMID® brand. Here we are working with our value chains to substitute up to 100 % of fossil feedstocks with bio-circular raw materials such as residues from forestry or agriculture in a mass balance process. In addition, we

100 %
renewable energy

up to 100 %
bio-circular feedstock

more than 40 %
CO₂ savings



use renewable energy for manufacturing. These two measures lead to a reduction in the CO₂ footprint of about 50 %.

For you, our valued customer, this means NO CHANGE. The sustainable TROGAMID® eCO grades replace the fossil-based products 1:1 with the same quality. You use the same equipment and the existing processes for your production.

→ See how the mass balance approach works in this video.

**[www.trogamid.com/
trogamid-eco](http://www.trogamid.com/trogamid-eco)**



OUR TOOLBOX

SOLUTIONS FOR FRAMES

→ Bio-based

→ Bio-circular

→ 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 frames

We not only offer you high-performance polymers for lenses, frames and coatings, but go beyond that with our support services. We assist you from initial product idea to series production by means of chemical and physical analysis, worldwide on-site support in planning your production processes, and product trials in our technical centers in Germany, the USA and China.

We manufacture our products – your raw materials – in state-of-the-art facilities under strict quality guidelines certified to the latest ISO 9001 standard. The mass balance process for manufacturing sustainable TROGAMID® eCO grades has also been audited by independent bodies.

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

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



LEADING

BEYOND CHEMISTRY

Solutions for lenses

TROGAMID® myCX is a nylon grade specifically developed for eyeglass lenses. TROGAMID® myCX eCO is our line of materials that combines sustainability and the highest optical quality.

TROGAMID® myCX and myCX eCO 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 outstanding properties.

Thanks to their unique properties TROGAMID® myCX and myCX eCO nylons allow very efficient production

of eyeglass lenses that can be combined with any frame material. Special product modifications with stabilizers, absorbers, or colors are available on request.

Lenses made from these grades developed specifically for this application 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 images because of the high Abbe value

Solutions for coatings

As your partner we understand the optical market as a complete process chain, not limited to just our materials for frames and lenses. Therefore, we offer the following additional solutions:

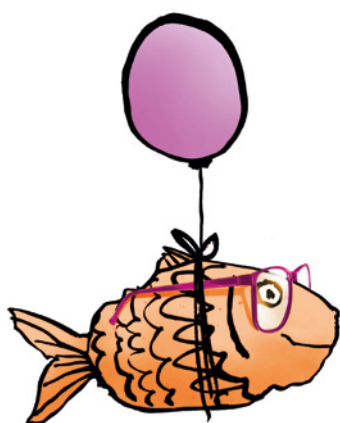
- materials for UV-protection
- pol films for contrast enriched view
- proofed coating chemicals and processes with different systems

Solutions for frames

**TROGAMID®
CX7323**

**TROGAMID®
eCO**

Transparent and micro-crystalline nylons for filigree and fatigue-resistant sports eyewear frames



TROGAMID® CX7323 and TROGAMID® eCO

TROGAMID® CX7323 and TROGAMID® eCO are microcrystalline and transparent nylons for injection molding of eyeglass parts. The materials appear transparent to the human eye because the crystallites are so small that they do not scatter visible light. The crystalline structure is the reason for the excellent crack and chemical resistance of these polymers.

TROGAMID® CX7323 • TROGAMID® eCO



TROGAMID® eCO is the sustainable development of TROGAMID® CX7323, in which up to 100 % of fossil raw materials are replaced by bio-circular feedstocks.

Key features

- Filigree:
 - high elastic modulus
 - flowability
- Light colors:
 - no yellowness
 - > 90% transparency
- Ultra-strong:
 - high fatigue resistance
 - high impact resistance
- Easy to clean:
 - microcrystallinity
 - smooth surface
- Medium viscosity
- Permanently transparent

Product offering

TROGAMID® CX7323 and TROGAMID® eCO are supplied as spherical pellets in moisture-proof packaging ready for processing.

Typical applications

- Filigree and fatigue-resistant frames
- Impact demanding frames of sport glasses

TROGAMID® CX9704

Transparent
amorphous nylon for
sunglasses frames



TROGAMID® CX9704

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

Key features

- Filigree:
 - high elastic modulus
 - flowability
- Light colors:
 - no yellowness
 - > 90% transparency
- Ultra-strong:
 - high fatigue resistance
- Lightweight:
 - 1.02 g/cm³ density
- Easy to clean:
 - 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

- Sunglasses frames

TROGAMID® CX impact

Microcrystalline,
impact-modified long chain
nylon for safety glasses and
sporting goods



TROGAMID® CX impact

TROGAMID® CX impact is an impact-modified, non-transparent nylon for injection molding of eyeglass parts, especially for applications where eye safety is important.

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
- Sporting goods

VESTAMID® Terra

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



VESTAMID® Terra

VESTAMID® Terra is semi-crystalline, providing high mechanical resistance and chemical stability. It absorbs very little water and thus its mechanical properties and high dimensional stability change only minimally with changes in ambient 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). Since both monomers are derived from castor oil, VESTAMID® Terra is a material that is 100% based on 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 kid's glasses
and soft parts in sports
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 following ISO 10993-1 recommendations for devices with long term skin contact. Tests included skin sensitization according to ISO 10993-10 and irritation by intracutaneous administration according to ISO 10993-23. No adverse results were observed.

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

- Kid's glasses
- Soft parts in sports glasses

PROPERTIES

Unit

Test method

TROGAMID®
CX9704

Density		g/cm ³	ISO 1183	1.02
Transmittance	2 mm	%	ASTM D 1003	92
Haze	2 mm	%	ASTM D 1003	2
Mold shrinkage				
Mold shrinkage (MD, TD) Melt: 280 °C, mold: 80 °C	in flow direction	%	ISO 294	0.5
	in transverse direction	%	ISO 294	0.6
Water absorption				
Saturation		%	ISO 62	3.5
CHARPY impact strength				
23 °C		kJ/m ²	ISO 179/1eU	N
-30 °C		kJ/m ²	ISO 179/1eU	N
CHARPY notched impact strength				
23 °C		kJ/m ²	ISO 179/1eA	10
-30 °C		kJ/m ²	ISO 179/1eA	10
Tensile test				
Stress at yield	50 mm/min	MPa	ISO 527/1A	60
Strain at yield	50 mm/min	%	ISO 527/1A	8
Nominal strain at break	50 mm/min	%	ISO 527/1A	>50
Tensile modulus	1 mm/min	MPa	ISO 527/1A	1500
Differential scanning calorimetry (DSC)				
Glass transition temperature T _g		°C	ISO 11357	132

Solutions for **frames**



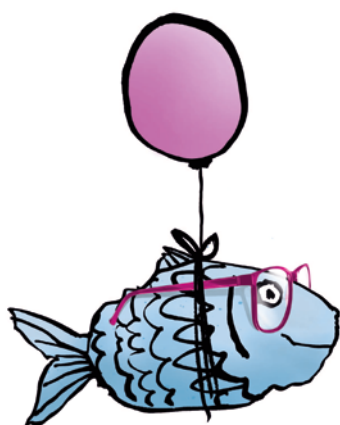
TROGAMID® CX7323	TROGAMID® eCO	TROGAMID® CX impact	VESTAMID® Terra DS16	VESTAMID® Care ME26
1.02	1.02	1.02	1.04	1.0
92	92	53	39	
2.1	2.1	81	39	
0.7	0.7	0.74	1.4	
0.8	0.8	0.87	1.5	0.7
3.5	3.5	3.5	1.8	
N	N	N	N	N
N	N	N	N	N
11	11	45	7	N
11	11	34	7	N
60	60	40	54	
8	8	8	5	
160	160	>50	>50	>500
1400	1400	1070	1700	18
140	140	135	37	

Solutions for lenses

**TROGAMID®
myCX high flow**

**TROGAMID®
eCO**

High flow and sustainability
for premium gradient tinted
lenses



TROGAMID® myCX series

TROGAMID® myCX high flow and TROGAMID® eCO are microcrystalline transparent nylons used for injection molding of parts in the optical industry, e.g. lenses. The material appears transparent to the human eye because the crystallites are so small that they do not scatter visible light. The crystalline structure is the reason for the excellent crack resistance of these polymers.

TROGAMID® myCX series



TROGAMID® eCO is the sustainable grade of TROGAMID myCX high flow, in which up to 100% of the fossil feedstock was replaced by bio-circular feedstock during production and was manufactured entirely with renewable energy.

Key features

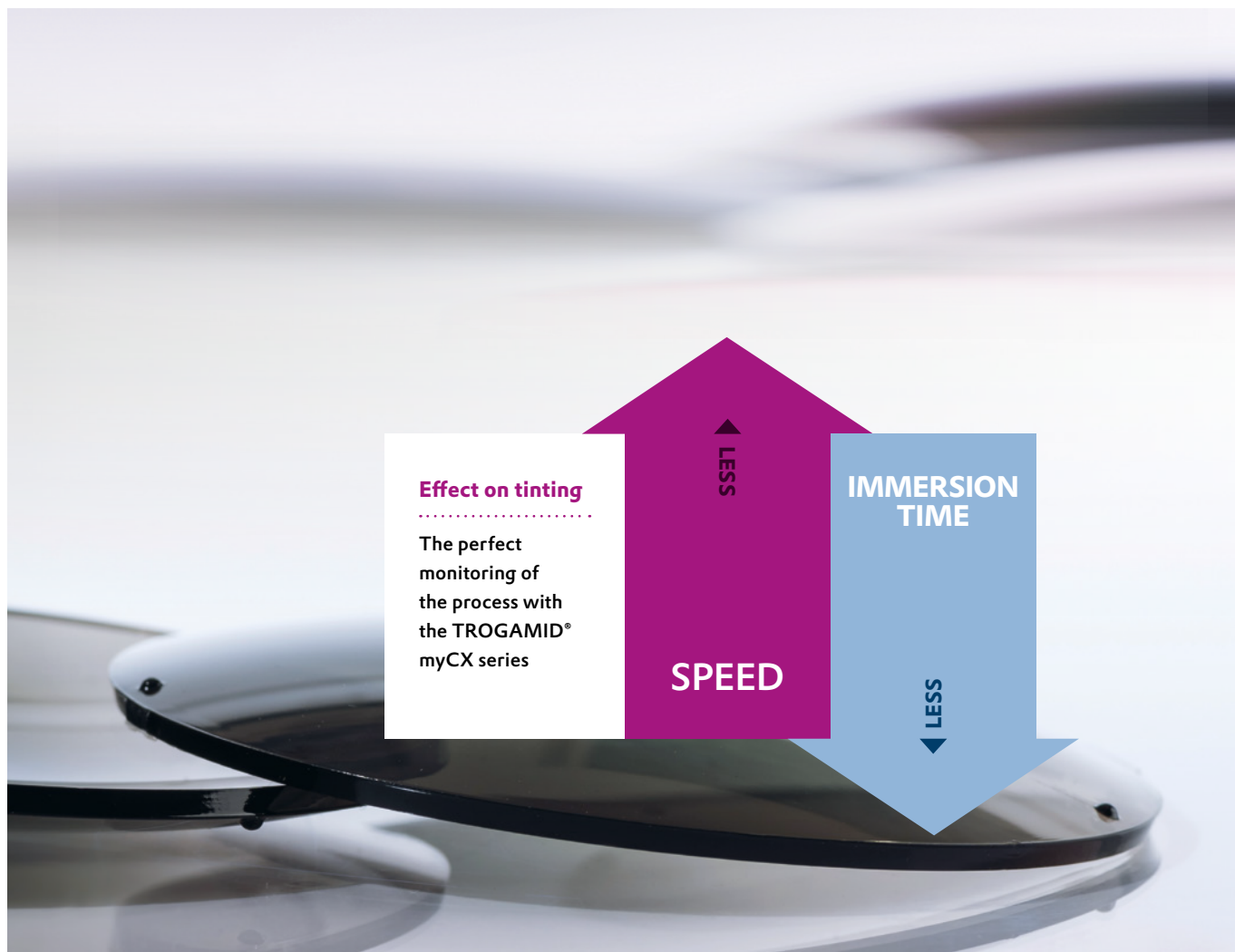
- Durable
- Lightweight
- Superior stress cracking resistance
- Chemical resistance
- Ultra strong
- Abbe value of 52

Product offering

TROGAMID® myCX high flow, TROGAMID® eCO, 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® eCO
Density	g/m ²	1.02	1.02
Transmittance	%	92	92
Haze 2 mm		2.1	2.1
Flow spiral		++	++
Yield rate		very high	very high

TROGAMID® myCX series

Solutions for lenses

PROPERTIES



**TROGAMID®
myCX high flow**

**TROGAMID®
eCO**

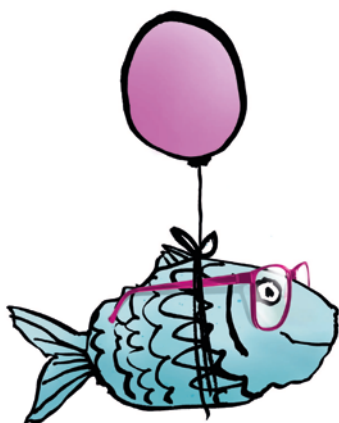
		Unit	Test method
Density		g/cm ³	ISO 1183
Transmittance	2 mm	%	ASTM D 1003
Haze	2 mm	%	ASTM D 1003
Mold shrinkage			
Mold shrinkage (MD, TD)	in flow direction	%	ISO 294
Melt: 280 °C, mold: 80 °C	in transverse direction	%	ISO 294
Water absorption			
Saturation		%	ISO 62
CHARPY impact strength			
23 °C		kJ/m ²	ISO 179/1eU
-30 °C		kJ/m ²	ISO 179/1eU
CHARPY notched impact strength			
23 °C		kJ/m ²	ISO 179/1eA
-30 °C		kJ/m ²	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 _G		°C	ISO 11357

1.02	1.02
92	92
2.1	2.1
0.7	0.7
0.7	0.7
3	3
N	N
N	N
11	11
11	11
59	59
8	8
>50	>50
1480	1480
137	137

TROGAMID® myCX series

Solutions for **lenses**

Solutions for coatings



UV-protection*

**TROGAMID® CX7323,
TROGAMID® myCX systems,
and TROGAMID® eCO**

→ UV cut masterbatch
TROGAMID® UV eCO is available
for all TROGAMID® grades.

* UV-cut off

Solutions for **coatings**



Pol film solutions

TROGAMID® CX based 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
well with our TROGAMID® myCX
series and TROGAMID® eCO.

SAFETY

IN HANDLING

The TROGAMID® and VESTAMID® grades mentioned in this brochure are not classified as dangerous, according to the CLP regulation. 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 respective safety data sheets available upon request.

Recycling is 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.

TROGAMID® grades are stable under the processing conditions recommended by Evonik. Care should be taken to ventilate the working area properly.

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, the materials will burn. From melt temperatures of 360°C / 370°C (680 F / 700 F), 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.

→ You can find specific product information in our plastics database.

www.plastics-database.com



WE HAVE THE RIGHT MATERIALS

TO TAKE YOU TO THE TOP!



Processing

The right service onsite

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

Our services

Plastics Database

The new material database containing all the products available from 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 pre-select suitable materials from a variety of grades for your application.

- You can find our Database at:
www.plastics-database.com



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