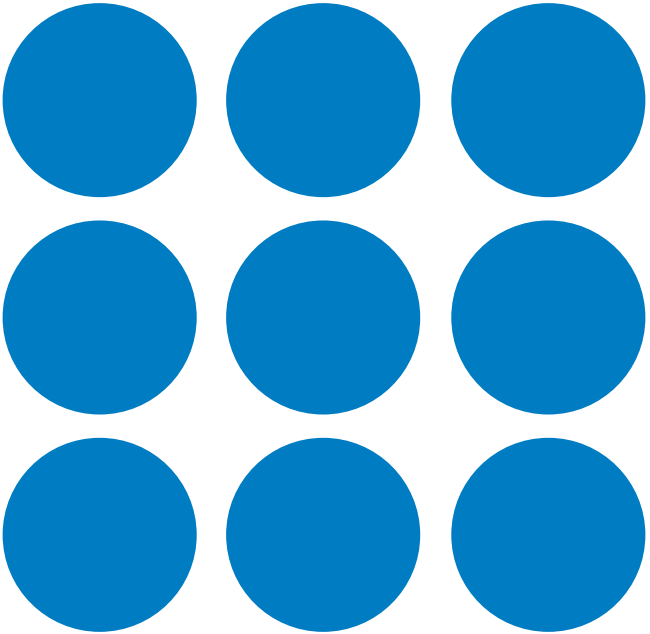


Systematical Surfaces.

Industrial TOPOCROM® surfaces overview.



topocrom



Your powerful partner for high-quality surfaces.

40 years industrial experience

Our companies have very long lasting industrial experience in the field of surface engineering. Repeatedly challenged by demanding requirements of our customers from the machinery and automotive industry, steel mills and processing industries, our solutions have led to groundbreaking improvements in several industrial sectors.

Lead due to research and development

We are development leader in our industry. Our great willingness to research and test innovative surfaces with special characteristics has led to new layer systems and to the environmentally friendly, modern and energy-efficient reactor system. We develop new forward-looking solutions in cooperation with our customers and leading research institutes.

Quality, Environment, Sustainability, Values.

This is what Topocrom GmbH stands for.

Certified management system

Topocrom GmbH is based on processes according to ISO 9001:2015 and ISO 14001:2015. More certificates and processes are integrated into an overall system to meet customer requirements and to increase customer satisfaction.

Topocrom – a sustainable technology

The TOPOCROM® surface structure generates a decisive benefit; furthermore, the TOPOCROM® layer is a perfect wear and corrosion protection and extends the service life of the parts. The closed reactor principle in our company meets the highest standards for humans and environment and ensures an energy-efficient manufacturing of coatings.

Important values we stand for

Humans, products, partners, corporation and owners form the value system for our daily actions. They form the basis for strategic decisions.

Approval for TOPOCROM® – ready for future.

Positive decision of the EU Commission. Approval for TOPOCROM® for a period of 12 years in accordance with EU Regulation No. 1907/2006.

ECHA has examined the application of Topocrom GmbH and recommended to the EU Commission an approval for a period of 12 years.

The European Chemicals Agency (ECHA) has issued an approval recommendation of 12 years for the functional TOPOCROM® processes in the closed reactor system.

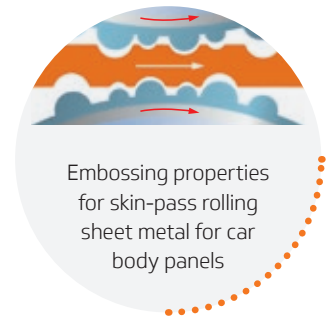
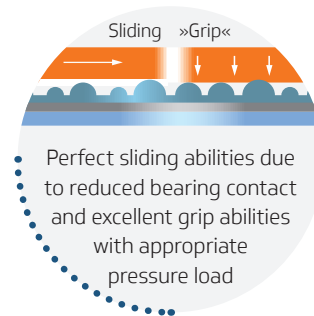
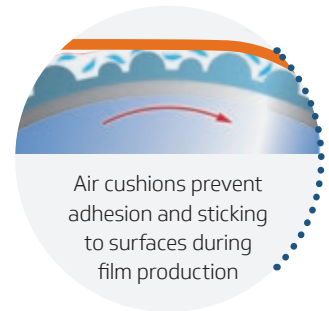
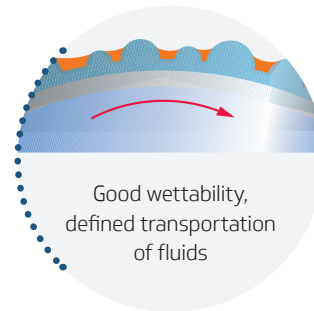
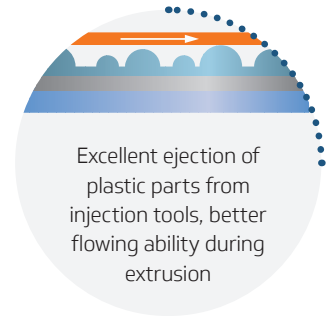
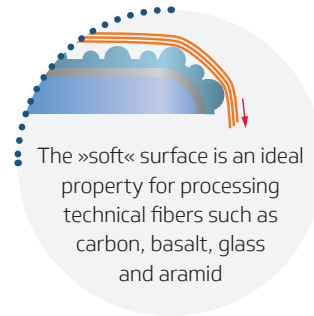
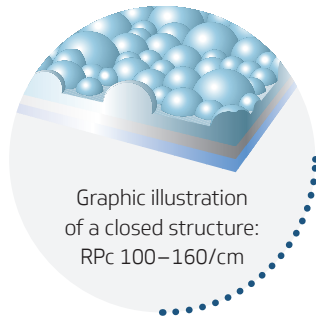
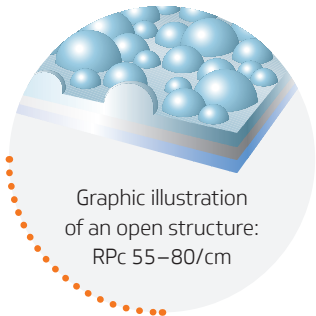
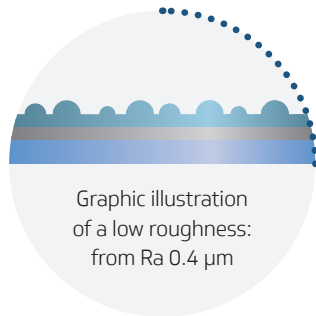
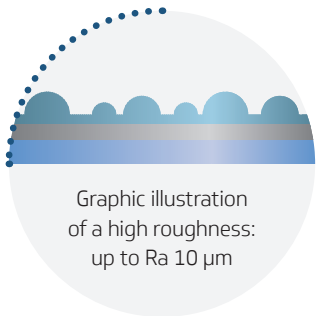
Chromium trioxide (CrO₂) has been qualified as a substance of very high concern by the European Chemicals Agency (ECHA) and may therefore since September 2017 only be used after prior approval by the EU Commission. Chromium VI is required by companies producing metallic chromium layers.

We guarantee absolutely chrome(VI)-free Topocrom® coatings

TOPOCROM® uses chromium trioxide only in closed reactors, any residue will be removed during subsequent cleaning.

Characteristics of TOPOCROM® layers.

The TOPOCROM® principle allows a definite composition of various topographies with quite different characteristics for the industrial use.



Generation of TOPOCROM® layers.

Chrome plating in closed reactors

TOPOCROM® layers are produced according to the closed reactor principle. Reactors with different sizes are available for single item and serial production. This technology enables the generation of structured surfaces in a continuous single process step.

The customized parameters of the plating process are saved in the database. Thus, an exact reproduction of the required layer system is guaranteed.

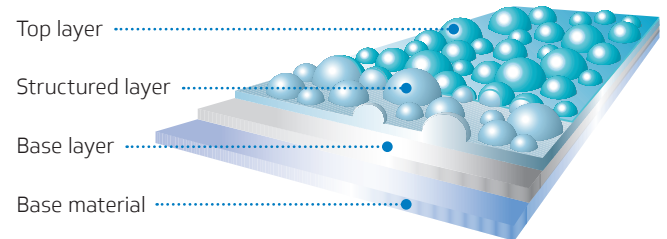
Illustration on the right: Cross section of a TOPOCROM® reactor: During the electroplating process the reactor is closed hermetically after installing the work piece. Afterwards the computerized electroplating process goes on exactly and reproducibly.



Adjustable surfaces

The structured chromium surface can be individually adjusted to achieve properties according to customers' demands. The composition of the layer system, the thickness of layer and the suitable surface structure are thus defined individually and selectively: based on the function and the required characteristic our engineering develops the suitable formula. By means of sample coatings the results can be controlled for a pilot application.

TOPOCROM® layer system



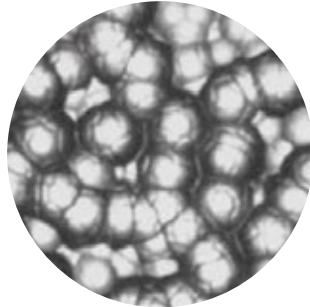
Facts and figures of TOPOCROM® layers.

Surface features

- Rz values: 4–80 μm
- Ra values: 0.4–10 μm
- Thickness tolerance: +/- 10%
- Topography tolerance: +/- 15%
- Open and closed topography

Surface structure

The picture on the right shows a macro photograph of a TOPOCROM® surface with closed structure.



Characteristics

- Hardness: 750–1100 HV
- Melting point: ca. 1850°C
- Magnetic behavior: non-magnetic

Components suitable for chrome-plating

- Individual and serial parts
- Small and large components

Base materials suitable for chrome-plating

- Steel, Steel alloys, Cast iron
- Stainless steel
- Copper, Copper alloys
- Aluminum and Aluminum alloys
- Titanium, Titanium alloys



Base material requirements

- The functional surface has a roughness of $Rz \leq 4 \mu\text{m}$ and no surface defects.
- The functional areas should be marked clearly on the drawings.



Optimum processing of technical filaments.

carbonprocessing

Avoidance of process interruptions

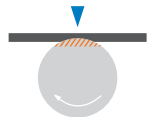
The automated processing of technical fibers as carbon, aramid, glass, basalt and ceramics knows a common challenge. If fibers or filaments break, tear, stick or splice during processing, this leads to interruptions in operation. This is often due to an unsuitable surface of the guiding element.



Filament break during filament guiding process due to unsuitable surface.



Signs of splicing arise e.g. during roving processing.



Composite fibers can be very **abrasive**.

Topocrom GmbH arranges the complete production of components with subsequent TOPOCROM® coating.

- ✓ Prevention of splicing
- ✓ Significantly reduced dust formation
- ✓ Less adhesion of filaments
- ✓ Prevention of wrapping
- ✓ Wettability with fluids (Avivagen)
- ✓ High wear resistance



Printing and plastic film industry.

rollstructuring

Coating of rollers and rolls as a core competence

TOPOCROM® coating in cylindrical reactors is very suitable for the surface coating of rollers and rolls. According to the surface requirements, parts of printing machines (offset, gravure printing, digital printing) get the desired properties:

Characteristics

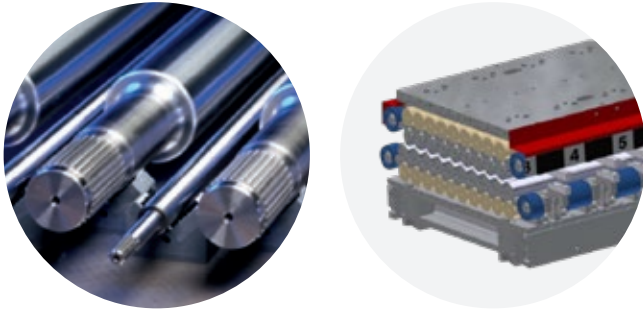
- Transport of fluids, scooping ability of the roll body surface
- Hydrophobic and hydrophilic surfaces
- High resistance to wear, mechanical and chemical
- Optimized corrosion resistance due to sulfamate nickel layers



Leveller/feeder rolls: Surface with grip.

rollstructuring

For the use in the metal sheet industry.



Roll surfaces with maximum grip for trouble-free processing of metal sheet in feeding or leveler machines

Thanks to the TOPOCROM® coating the rolls show an ideal feeding behavior and reduced slip during the transport of metal strips treated with oil or lubricant. Furthermore the lifetime of the rolls is significantly increased by the surface coating.

Test results of levelling machine manufacturers confirm:

Compared to conventional coating, TOPOCROM® coated rolls show:

- Excellent wear resistance
- Optimized friction coefficient
- Longest service life
- For feeding intensely lubricated metal sheet strips or plates only a TOPOCROM® coating offers the necessary friction
- Optimum grip, decrease of slip
- Use of one single type of roll for processing different sheet surfaces
- Resilient to bending and torsion
- Transmission of torque from the roll to the material by friction

Application in steel works.

rollstructuring

Texturing of metal sheet

In the automotive industry car body panels textured by TOPOCROM® coated skin pass rolls are increasingly used. These metal sheet surfaces considerably ameliorate the forming behavior and form an ideal basis for modern painting without filler.

TOPOCROM® is deposited in the closed reactor system as described before. Due to the high transport weight of such rolls steel works operate their own plating plant.

If you are interested in an own TOPOCROM® plating facility please contact us. TOPOCROM® Systems AG supplies the appropriate technology.



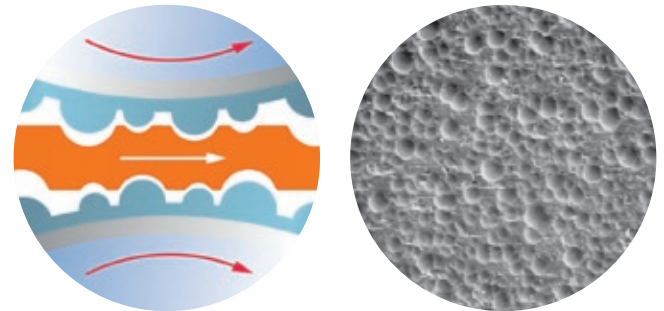
The matt surface of the skin pass roller shows the TOPOCROM® coating.

Important advantages

The TOPOCROM® textured metal sheet surface shows stochastically distributed cavities transferred by the skin pass roll. This sheet surface is especially characterized by variable surface topographies. The graphic illustration on the left side below shows the process of texturing. The microscopic picture on the right side shows the surface of a skin passed metal sheet. Test reports of the steel and automotive industry are available on demand.

Advantages of a TOPOCROM® textured metal sheet:

- Long service life of work rolls
- High variability of the metal sheet surface structure
- Excellent painting and forming behaviour
- Low long and short waviness



TOPOCROM® for plastic injection tools.

easyject

The use of TOPOCROM® coated molds and dies in the plastic injection industry has been successfully proven for many years. In comparison with other types of coated or structured surfaces, TOPOCROM® achieves considerably better results in a variety of ways.

The maximum coating temperature in the reactor during the coating process is less than 70°C therefore a wide range of material can be chosen.

Cost-effective rework of used injection molding tools

If there is no mechanical damage to the base material, the tool can be recoated after de-chroming without any interim machining.

Advantages on the mold

- Better ejection
- Up to 30% quicker cycle times
- Less or no release agent is required
- Less pressure and effort during ejection
- Better heat distribution over the mold surface
- High resistance to wear and corrosion

Advantages for the plastic part

- Better heat distribution over the mold surface
- Option of smooth or structured surfaces



Extrusion technology.

easyject

Process technology with a commitment to continuity of production

The special characteristic of the process: In the plastic industry extruders are used to produce profiles, tubes, foils etc. from granulate material. During this process granulate is pressed through a female die using heat and pressure (e.g. as viscous molten compound). For this operation a workflow without interrupts is extremely important. TOPOCROM® coated molds show longer service life, help avoiding disposal and thus causes continuity.

Demands of the plastic industry

- Lower costs for material and energy consumption
- Lower rejection rate during the process of product changes
- Decrease of material changing time
- Optimization of the product changing process
- Good and fast cleaning the tool at changing the material

Selectable surface characteristics thanks to TOPOCROM® coating

During the plating process surface topography and tribological characteristics can be exactly defined (roughness, wettability, open or closed structures). The use of TOPOCROM® coated tools shows measurable benefits in the production process:

- Avoiding deposits
- Significantly less abrasion
- Better flowing ability
- Longer service life



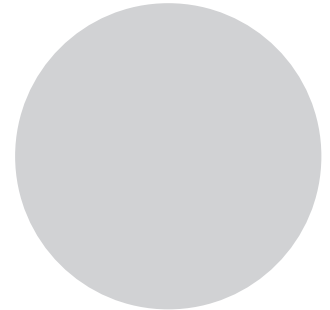
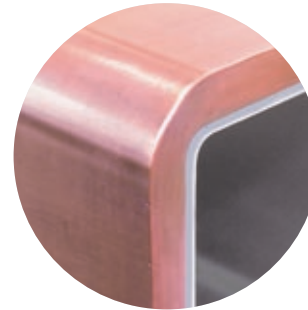
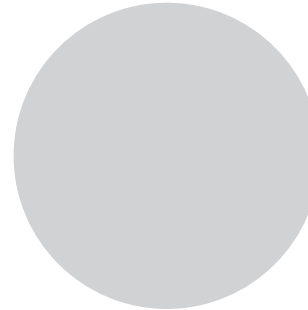
Interior coating of continuous casting molds.

highresistance

Longer service life even under extreme conditions

When fluid steel flows through the water-cooled continuous casting molds high temperature, pressure and abrasion occur. The mold is extremely stressed by the uninterrupted flow of the fluid steel. The high temperature results in particularly extreme abrasion. The resistance of the TOPOCROM® structure to this abrasion mechanism is however very high. The experiences of steelworks show a double or triple service life.

It is quite remarkable that the thickness of layer is exactly defined over the entire cross section (see picture right) continuous casting mold; even in the radii. The layer thickness can be maintained constantly during the coating process.



Gradientcrom® – For special parts.

More layers, unique possibilities.

Gradientcrom® is a special TOPOCROM® process that offers great corrosion protection. The multi-layer system is characteristic for this technology. The individual layers are distinguished by different hardness.

By means of a special deposition procedure in the closed reactors, compression stress arises in the functional surface of the chrome layer.

Interior coating of concrete pumping pipes.

Transport pipes for concrete, sand, gravel or mixture are subject to a high degree of abrasion. Compared to conventionally electroplated or hardened pipes, TOPOCROM® coatings provide considerably longer service life. In operation, measurable benefits and advantages have been proven. The coating is also suitable for transport pipes of suspension in the chemical industry as both abrasion and corrosion is reduced.

Areas of applications

- Transport pipes for concrete pumps and slurry pumps
- Pipes in the chemical and petroleum industries
- Pipework installations in sewage treatment plants
- Transport pipes for waste disposal
- Transport of suspensions
- Sugar, pulp and multiphase mixtures in the chemical or food industry

Characteristics of the surface

- Interior layer thickness of the pipe up to 500 µm
- Optimized residual stress due to Gradient® surface
- Multiple layer system
- Optimum hardness, adapted ductility
- Precisely adjusted number of cracks

Advantages for the user

- Higher system availability
- Low maintenance costs
- Distinctly better corrosion and abrasion resistance compared to hardened or otherwise coated pipes

TOPOFLON® – for extremely low friction values.

Significantly reduced abrasion

TOPOFLON® is based on a TOPOCROM® layer into which PTFE anti-friction substances have been integrated by an additional chemical treatment. The field of application of TOPOFLON® is diverse. In case of special requirements, please contact our qualified personnel.

TOPOFLON® characteristics

- Hardness TOPOCROM® layer: max. 1100 HV
- Electrical conductivity: antistatic, non-insulating
- Layer thicknesses: e.g. 30–40 µm or according to prior discussion
- All electrically conductive metals can be coated
- Outstanding heat conductivity (99,8%)
- Temperature resistance of Teflon particles: -240° to +250°

Applications in following industries:

- Plastics industry, e.g. extrusion dies
- Food industry, e.g. stirring devices, dough nozzles
- Pharma industry, e.g. sorting and transporting devices
- Packaging industry, e.g. welding dies, sonotrodes



Overview TOPOCROM®.

carbonprocessing

Process reliability in fiber processing.

Industries

- Carbon industry
- Textile machinery
- Nonwoven production
- Chemical fibers

easyject

Focus on best ejection.

- Injection molding tools
- Extrusion tools

rollstructuring

Defined characteristics on rolls and rollers.

- Printing machines
- Sheet metal processing
- Films

highresistance

Highest strain and resistance against abrasion.

- Steelworks
- Machine building industry

Coated Components

- Eyelets
- Spools
- Funnels
- Deflection elements
- Spreading elements
- Thread eyes
- Guiding elements
- Rollers
- Sizing rolls

- Cores
- Ejector pins
- Cavities
- 2K-tools
- Mandrels
- Nozzles
- Screws
- Multi-skin sheet
- Molds
- Smoothing rolls
- Calender rolls

- Feed Rollers
- Straightening Rollers
- Measuring wheel
- Skin pass rollers
- Dampening rolls
- Pressure cylinder
- Deflection rollers
- Laminating cylinder
- Embossing rolls

- Continuous casting molds
- Thick matter cylinders
- Forming tools
- Disposal pipes



www.topocrom.com
info@topocrom.com



Topocrom GmbH
Hardtring 29
78333 Stockach

Phone (D)
0049 (0) 7771 93 630



Topocrom Systems AG
Gewerbestrasse 8
CH-8212 Neuhausen am Rheinfall

Phone (CH)
0041 (0) 71 620 01 83