

**GUARANTEE**  
All our business processes, from research and development through to production and customer service, are subject to very strict quality criteria. We are proud to meet and uphold not only the quality requirements of ISO 9001 and further norms, but also the individual requirements of our customers.



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Coating  
Powder Solutions  
for Brake Discs

# Advancing Braking Excellence

Treibacher Industrie AG is an internationally successful company with production facilities in Althofen/Austria. Treibacher was founded in 1898 by Carl Auer von Welsbach and is currently family-owned. At Treibacher, we pride ourselves on developing highly specialized materials that make a decisive contribution to a sustainable future. As a leading manufacturer of hard materials tailored to the needs of our customers, we offer highly specialized products for various industries.



## Treibacher Industrie AG Specialists for Chemistry and Metallurgy

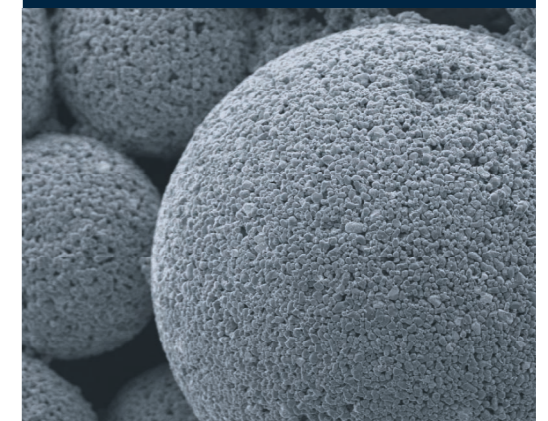
- 🕒 Company held by two Austrian family trusts
- 📍 Production site and headquarters in Austria
- 🌍 900 employees worldwide
- 🌐 Global presence in diverse B2B markets
- 👥 Over 5,000 customers worldwide
- 🏢 Parent company of Tribotecc GmbH

As we supply a variety of different products to different industries, we are used to developing customized solutions and bringing them to production scale as accurate and quickly as possible. All our business processes, from R&D through to production and customer service, are subject to very strict quality criteria.



## Your advantages with Treibacher

- 🕒 Over 40 years of experience in developing carbides/hard metals
- 🕒 Very fast development cycles (customizing & rapid prototyping)
- 🏢 Quality Made in Austria
- 🔬 Professional, extensive on site analysis laboratory
- 🕒 Test quantities of powder or coated brake discs quickly available



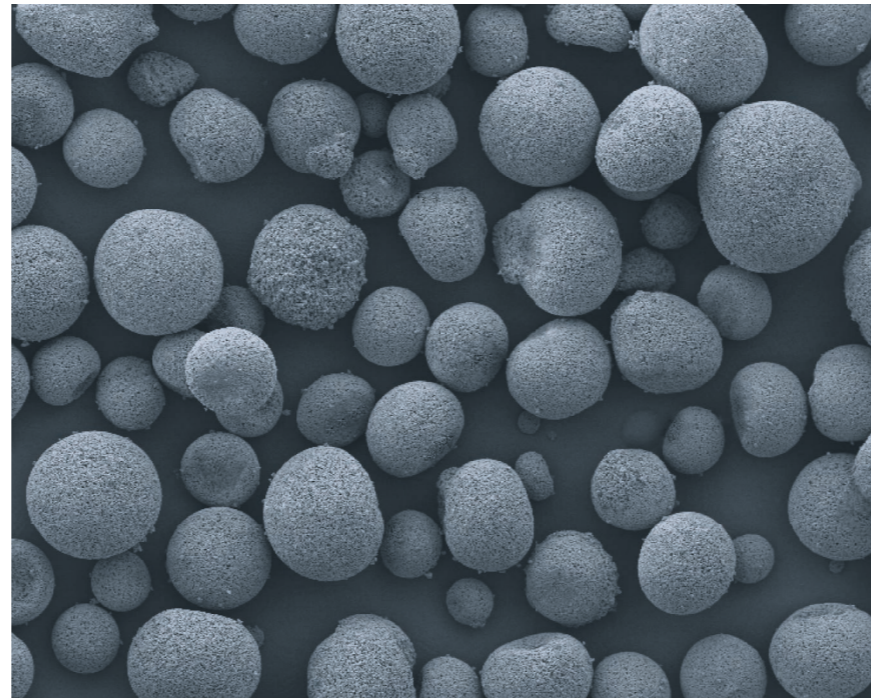
## EURO 7 Problem to Solution

With the implementation of the EURO 7 norm, for the first time, environmental standards focus on brake disc emissions. To offer tailor made solutions for the automotive industry, Treibacher analyzed existing problems at the time of initial developments and entered the market as fast follower. Treibacher has more than 40 years of experience with hard materials (carbides, nitrides, carbonitrides, borides), which facilitated a very fast development of new solutions for brake disc coatings. We call these solutions AuerBrake.

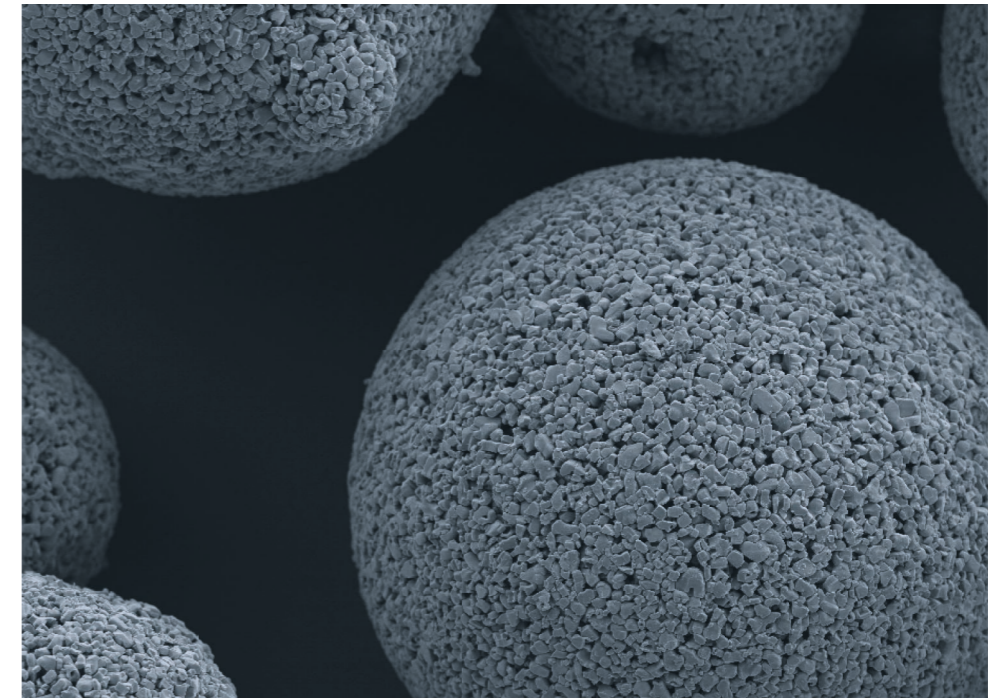
We are proud that we could establish a network to supply our customers not only with carbide powders, but also with finished discs, coated and ground by our partners. Meanwhile we are happy to have several trusted development partnerships with customers.



AuerBrake high performance coating powder for brake discs



SEM image of TiCN+Mo2C (200x)



SEM image of TiCN+Mo2C (1000x)

## AuerBrake

The AuerBrake portfolio includes all materials developed for brake disc coatings, first and foremost our titanium carbonitride with molybdenum carbide (TiCN+Mo2C). Other materials are currently under development and yet to come. All AuerBrake powders are manufactured to high quality standards in our state-of-the-art production facility in Austria. Production in the heart of Europe enables us to offer fast response times and utmost supply chain security to the leading markets. Our technical service team is easily available to discuss and support individual needs.

### TiCN + Mo2C

Titanium carbonitride (TiCN) has a number of properties that set it apart from titanium carbide (TiC) in brake disc applications, which is why we opted for TiCN. Molybdenumcarbide (Mo2C) is mainly added as a wetting agent.

### TiCN vs. TiC

- ☞ Elevated thermal conductivity
- ☞ Higher elevated temperature hardness
- ☞ Higher fracture toughness
- ☞ Enhanced stability in the matrix

### The role of Mo2C

- ☞ Increases the wettability of the carbonitride
- ☞ Ensures bonding in the steel matrix

### 5 reasons to opt for TiCN+Mo2C for your brake disc coatings:

- ☞ Can be used with all common laser systems (e.g. Laserline, Trumpf)
- ☞ Developed on the basis of common coating parameters
- ☞ Clear advantages in the layer structure, compared to conventional materials, due to higher carbide volume input
- ☞ High resistance to cracking and scoring
- ☞ Customizing possible through rapid prototyping (R&D team)

## Customization

With the capabilities of our R&D team you can realize almost every idea you have for your brake disc coating hard metal. Every step of our development process is precisely managed so we can smoothly scale up from laboratory to mass production. Industry leaders value our discretion so that your ideas remain your ideas.



Contact us with your idea via email or phone. Together we can investigate possibilities, feasibility and a time-to-market.



After initial discussions we agree on a first draft of a specification.



In the laboratory we are able to produce first small scale batches (5-50kg). This gives you the possibility to do tests inside your facilities and with your equipment. We also offer the possibility to provide you with coated brake discs (ready-to-test).



For further tests and higher quantities we can move to the production plant. This enables you to make more comprehensive tests with your customers and key opinion leaders.

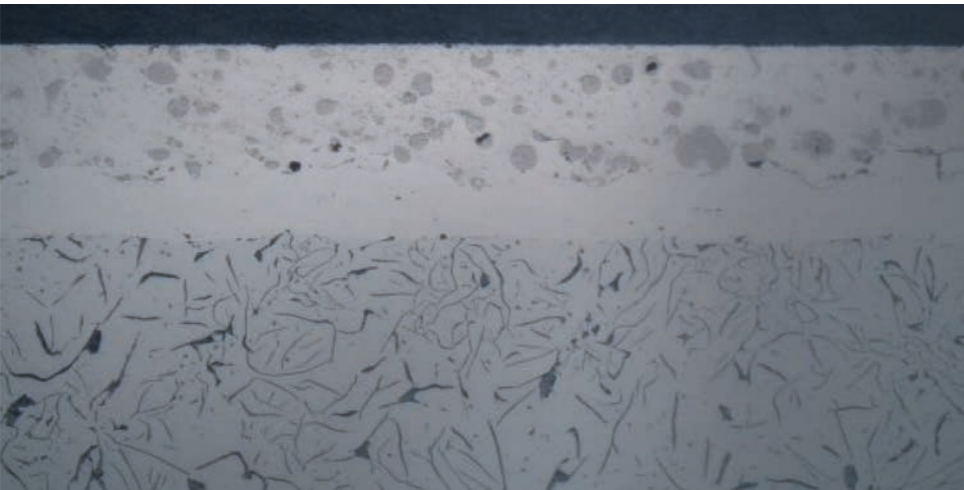


When the material is transferred to serial production everything is agreed with our Quality Management, Analytics and Production department.

# Coating Details

## TiCN+Mo2C adds value to your HS-LMD process

- ☞ TiCN+Mo2C agglomerates can be processed perfectly in the HS-LMD process
- ☞ TiCN is uniformly distributed in the coating and leads to a wear-resistant top layer without creating brittleness at the same time
- ☞ Carbide granules are partially maintained and partially fine dispersed in the matrix, as single particle or as clouds of fine particles
- ☞ Mo2C allows the agglomerated particles to soak up the steel matrix like a sponge, anchoring the particles firmly in the coating



Audi 318mm brake disc coated with 1.3820/1.3820+14wt.% TiCN+Mo2C

14wt.% correspond to 24vol.% in the top coat

## Carbide concentrations in the coating vary with the steel matrix composition

	1.3820		430L		316L	
	wt.%*	vol.%**	wt.%	vol.%	wt.%	vol.%
TiCFeCr (Reference)	16%	-	14%	16%	16%	16%
	14%	-	24%	14%	14%	33%
	16%	-	32%	16%	16%	38%
	18%	-	34%	18%	18%	40%
TiCN+Mo2C	22%	-	37%	22%	22%	42%

\* wt.% powder feeder rate  
 \*\* vol.% carbides in top-coat  
 vol.% are NOT based on calculation out of powder feeder rate, but have been measured with optical Keyence microscope (surface analysis)

Even with smaller quantities of powder, a higher concentration of carbides in the layer can be achieved. An improvement in performance, compared to common materials, is easily possible at the same cost. Carbide volumes pictured in this table have been measured with optical analysis.

# Brake Test Bench Results

## Results from several brake test benches prove the favorable effects of TiCN+Mo2C

Market-specific tests, including the AK Master and AMS 130, alongside more demanding trials, were conducted to evaluate the performance of coatings. The outcomes from various brake test bench experiments underscored the beneficial impact of the TiCN+Mo2C coating. Notably, the TiCN+Mo2C demonstrated superior crack and scratch resistance when compared to other optimized coating solutions available on the market. Additionally, it showed lower overall wear, than what is typically observed with other optimized coating solutions.



## The Impact of TiCN+Mo2C Coating on Wear

Brake discs coated with TiCN+Mo2C show lower disc wear compared to a wear-optimized disc coated with 16 wt.-% TiCFeCr (with the same test parameters). In this case AKM and AMS130 were conducted.

Please note: All test results are only valid for the parameters that were used in the respective test. To confirm these results with other steel matrix, other coating parameters, other brake pads, etc., we can provide powder or coated discs to perform tests in your system.

## Comparison of Wear (Brake pads not optimized)

