



## High-performance ceramic coatings for extreme conditions

Heat protection | UV resistance | Durability

TRL 9/9



## The challenge– **Extreme conditions require extreme solutions**

Materials in aerospace and industry are exposed to enormous stresses.

### **Thermal extremes**

- Materials must withstand temperature cycles from  $-200^{\circ}\text{C}$  to  $+500^{\circ}\text{C}$  in a vacuum
- High temperature changes often lead to cracking, flaking and embrittlement

### **Mechanical load & lack of adhesion (adhesion)**

- Vibrations & high mechanical forces stress material structures and coatings
- Decrease in adhesion and particle load lead to material wear

### **UV and radiation exposure**

- In space, intense UV & ionizing radiation lead to material ageing
- Organic materials discolour strongly or decompose in a vacuum when exposed to radiation

### **Thermal & chemical influences**

- Highly reactive environment can cause oxidation of materials
- Classic protective coatings (e.g. silicone or PU paints) fail in tough tests



## The solution – **High-performance ceramic coatings from CeraNovis**

Our patented coatings offer customized protection against these challenges.



### **Temperature resistance**

Resistant to temperatures up to 500°C in a vacuum, tested in the ESA test cycle



### **Thermal shock resistance**

Stable with rapid temperature changes between -200°C and +500°C



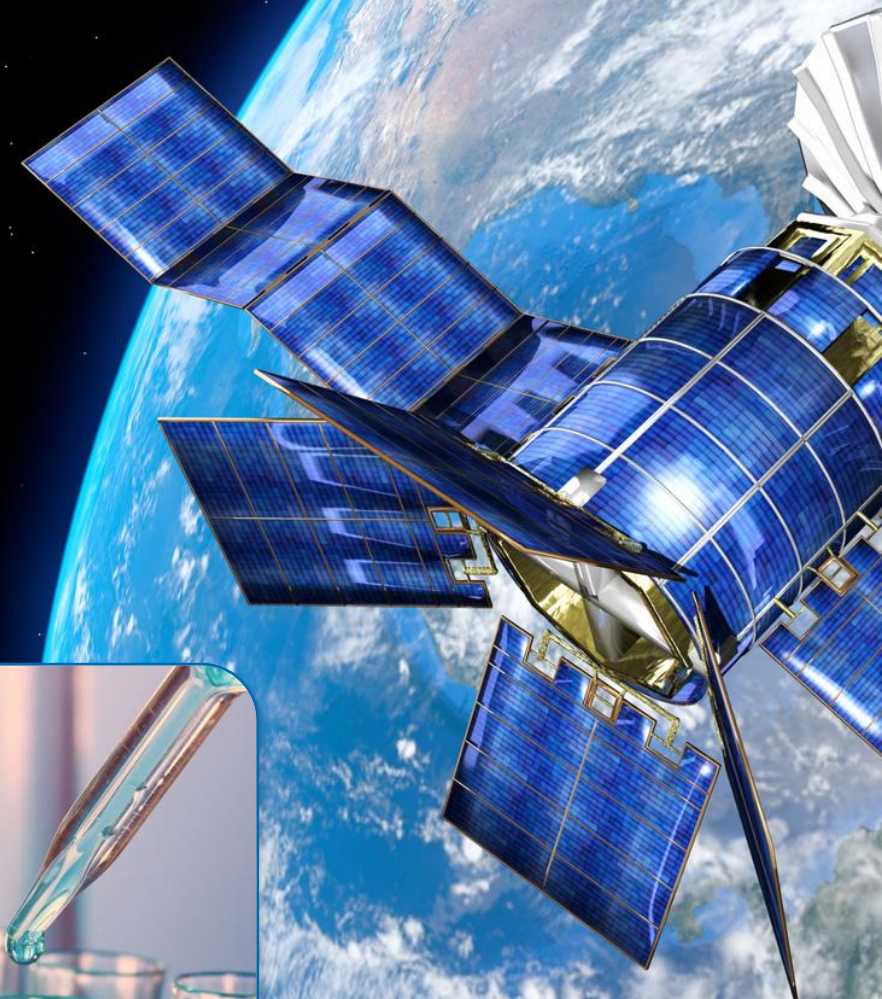
### **UV & radiation resistance**

No strong yellowing or decomposition even with extreme UV exposure and exposure to electrons and protons



### **Mechanical stability**

Excellent adhesion to the substrate and protection against chemical attack



## The technology behind the coating

Innovative material science for maximum performance.

### Nano & dispersion technology

- Homogeneous distribution of ceramic particles in a water-based formula
- High purity without organic carbons (no yellowing under UV and vacuum)

### Layer design & application

- Thin-film technology: application between 10-100  $\mu\text{m}$ , depending on requirements
- Easy to use: Manual spray application on complex surfaces
- Optional sealing (nanoglass) for additional durability and protection against contamination

### Optimized material composition

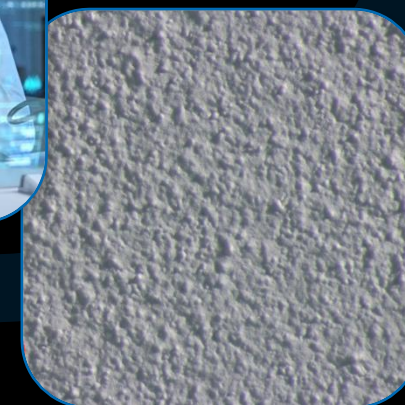
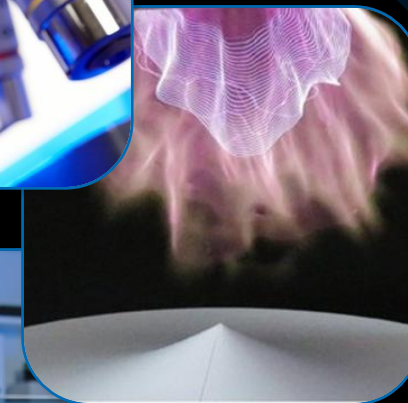
- $\text{Al}_2\text{O}_3$  (aluminum oxide) - High hardness, abrasion resistance
- h-BN (hexagonal boron nitride) - Flexibility & thermal shock resistance
- Potassium silicate - Highly reflective binder matrix

### Easy handling & environmentally friendly

- Water-based & solvent-free - no harmful emissions
- No chemical pre-treatment required, easy cleaning by sandblasting
- REACH/ROHS compliant, no CMR/SVHC substances
- Sterilizable/cleanable by UV/ozone

### Universal

- For titanium, aluminum, steel, CFRP, copper, kapton



## Areas of application & successful projects

Our coatings are already being used in the following key areas.



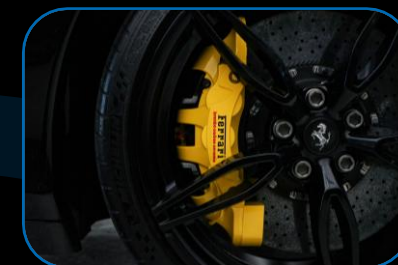
### Space travel & satellite technology

- Thermo-optical protective coatings for satellite missions (ESA and European space industry)
- Used for solar arrays, antennas, insulation, heat shields & instrument covers
- Proven long-term durability on missions such as BepiColombo, Solar Orbiter & on the ISS

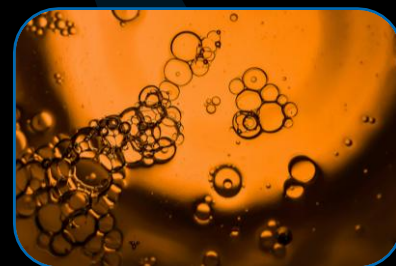
### Weitere Industrien



Anti-adhesion coatings



Automotive industry



Chemical industry



Thermal management

# Why CeraNovis? **Our unique selling points**

This is why our customers rely on us.



## **Tested and qualified by ESA & the industry**

Proven performance in space travel



## **Patented high-performance coatings**

Over 15 patent families protect our know-how



## **Individual adaptation to customer requirements**

Customized solutions for every application



## **Sustainable & environmentally friendly**

No harmful solvents, room temperature curing if required, low emissions



## **Cost-efficient & durable**

Extended service life & reduced maintenance costs

## Future & innovation – Our next steps

What comes next?

### New conductive white ceramic coatings

for satellites with improved ESD properties



### ATOX stable black coatings

with temperature stability up to 400°C in a vacuum



### Expansion into new industries

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### Mars & Moon missions

Test series for future space projects with NASA & ESA



### Optimization of the reflection values

for even greater efficiency in optical applications



### Autonomous driving via laser communication

for new European satellite networks



## Contact & Cooperation

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