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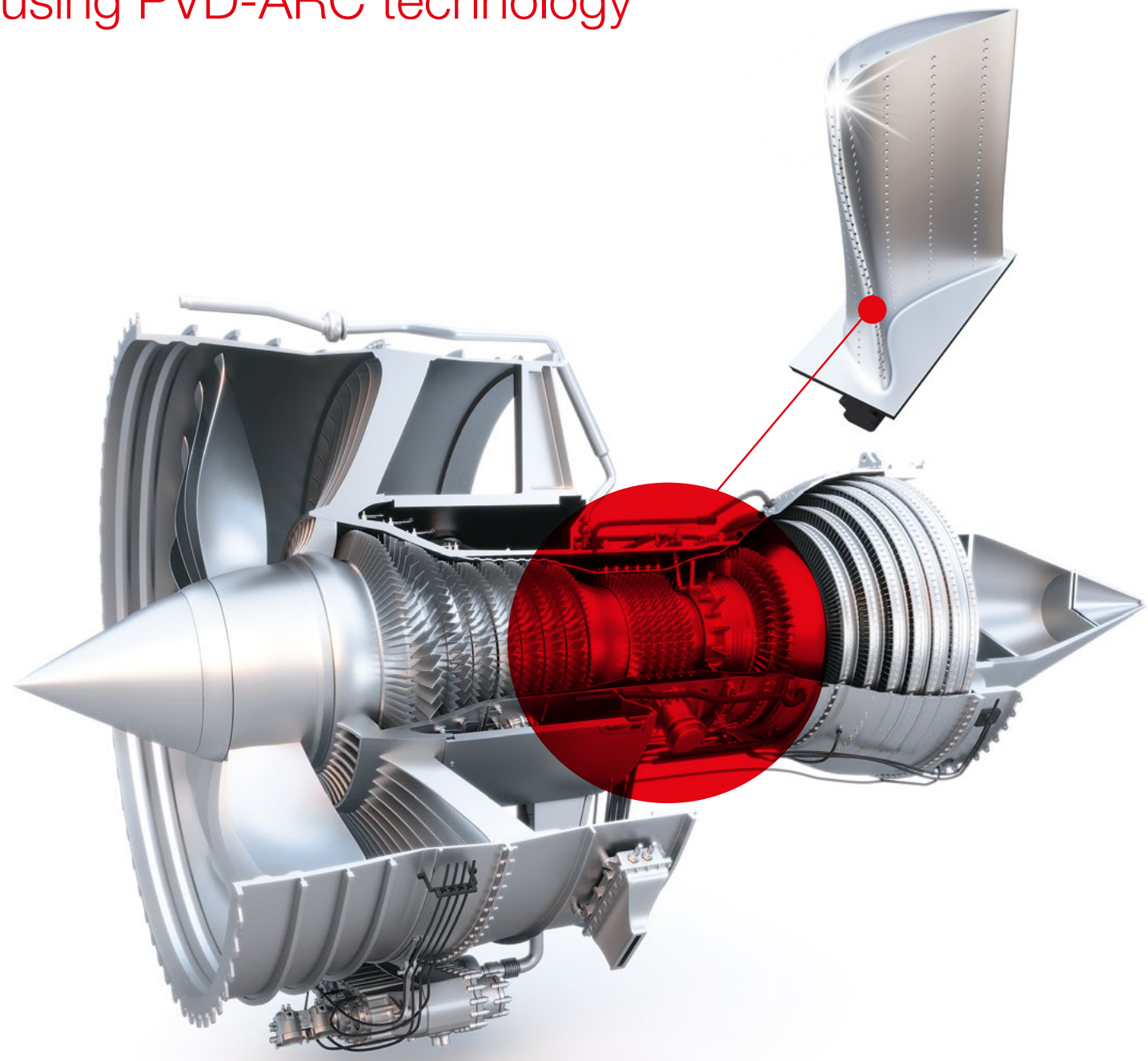
BALORA PVD MCrAlY

Next generation of dense MCrAlY coatings using PVD-ARC technology



Aerospace

Power Generation

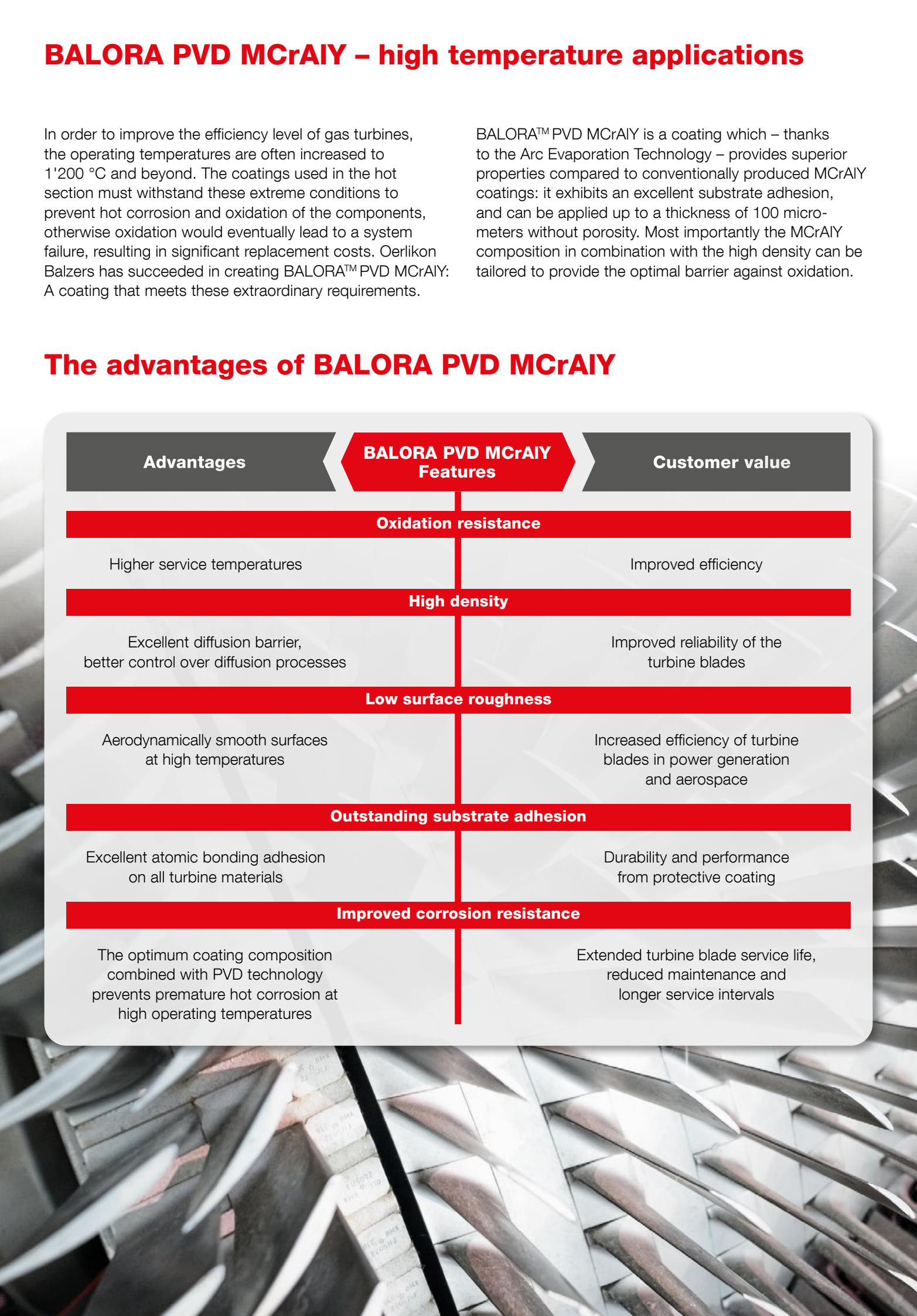
BALORA PVD MCrAlY – high temperature applications

In order to improve the efficiency level of gas turbines, the operating temperatures are often increased to 1'200 °C and beyond. The coatings used in the hot section must withstand these extreme conditions to prevent hot corrosion and oxidation of the components, otherwise oxidation would eventually lead to a system failure, resulting in significant replacement costs. Oerlikon Balzers has succeeded in creating BALORA™ PVD MCrAlY: A coating that meets these extraordinary requirements.

BALORA™ PVD MCrAlY is a coating which – thanks to the Arc Evaporation Technology – provides superior properties compared to conventionally produced MCrAlY coatings: it exhibits an excellent substrate adhesion, and can be applied up to a thickness of 100 micro-meters without porosity. Most importantly the MCrAlY composition in combination with the high density can be tailored to provide the optimal barrier against oxidation.

The advantages of BALORA PVD MCrAlY

Advantages	BALORA PVD MCrAlY Features	Customer value
	Oxidation resistance	
Higher service temperatures		Improved efficiency
	High density	
Excellent diffusion barrier, better control over diffusion processes		Improved reliability of the turbine blades
	Low surface roughness	
Aerodynamically smooth surfaces at high temperatures		Increased efficiency of turbine blades in power generation and aerospace
	Outstanding substrate adhesion	
Excellent atomic bonding adhesion on all turbine materials		Durability and performance from protective coating
	Improved corrosion resistance	
The optimum coating composition combined with PVD technology prevents premature hot corrosion at high operating temperatures		Extended turbine blade service life, reduced maintenance and longer service intervals

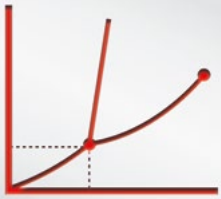


PVD coating design process: achieve a high-performing coating in just a few steps

SELECTION OF MATERIALS

1

Based on your specified data and application requirements, Oerlikon experts using advanced materials development thoroughly analyse, evaluate and select the most suitable material composition for the coating of your turbine component.



ANALYSE PHASE DIAGRAM

2

Oerlikon Metco manufactures the powder material that is optmised for the substrate material and the required operating range according to your specifications.

MANUFACTURING OF TARGETS

3

From the powders, we develop high-performance targets, utilised in our coating equipment. The targets are used to deposit the unique and dense coating onto your turbine component.

Coating properties

	Coating composition	Coating hardness H_{IT} (GPa)	Typical coating thickness (µm)	Coating application temperature (°C)	Max. service temperature (°C)	Colour
BALORA™ PVD MCrAlY	NiCrAlY (Ni, Ni/Co, Co)	7 – 11	0.1 to >100	400 – 500	Appr. 1'200	grey

*All given data are approximate values and dependent on application, environment and test conditions.

4

The subsequent coating is deposited in the high-end coating systems developed and manufactured by Oerlikon Balzers using Arc Evaporation Technology.

COATING OF COMPONENTS

5

The coating must undergo application relevant tests to ensure the applied coating meets customer specified requirements.

COATING OPTIMISATION

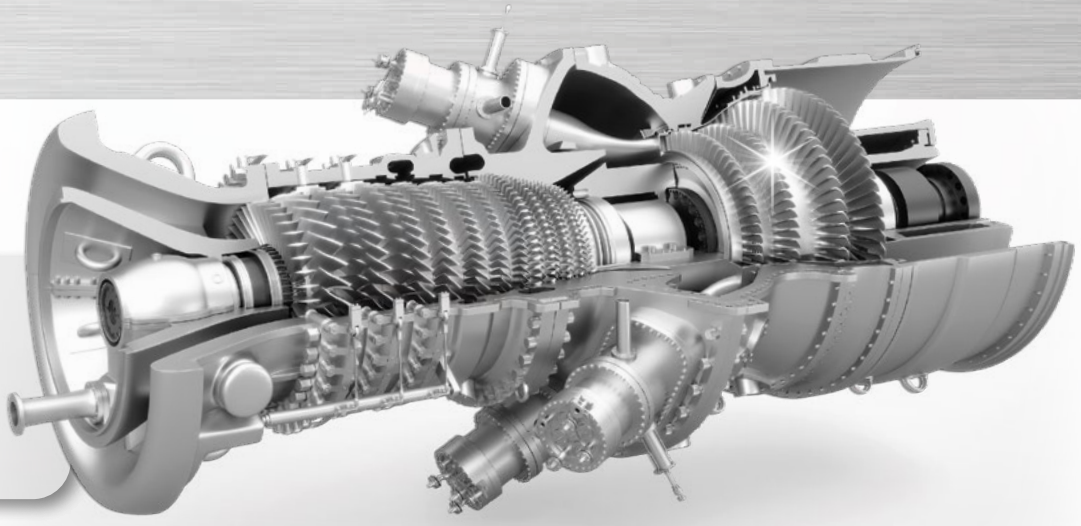
6

We assist customer tests for the targeted application to validate the performance.

PERFORMANCE TEST

7

The new coating is ready for customer qualification and serial production.



Using Arc Evaporation Technology in a vacuum environment, Oerlikon Balzers prevents the formation of oxides and other impurities in the coatings during the deposition process.

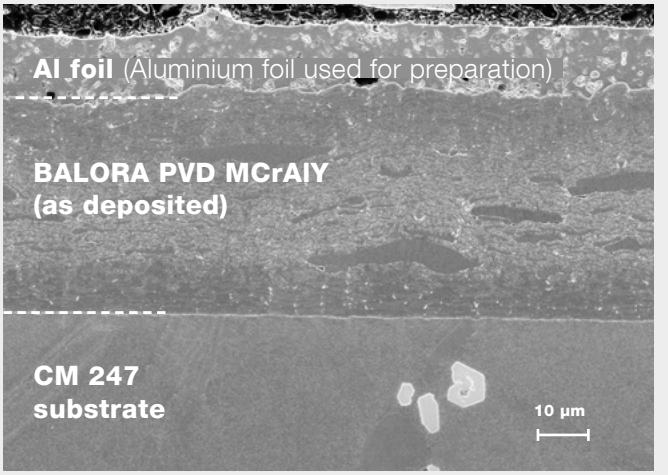
Enabling MCrAlY coatings with PVD technology

Typically, MCrAlY coatings are produced using thermal spraying and other technologies with a thickness of 200 µm or more, which provides a sufficient barrier for increased oxidation resistance whereas PVD coatings normally allow a deposition of no more than 20 µm.

Oerlikon Balzers has improved this traditional standard process for MCrAlY coatings by applying its proven high-end PVD-ARC technology to provide an efficient production process and significantly improved coating properties.

Oerlikon Balzers has developed BALORA™ PVD MCrAlY as a new solution by optimally combining the properties of both technologies to produce extremely dense coatings of up to 100 µm and more.

Micro-section of BALORA PVD MCrAlY

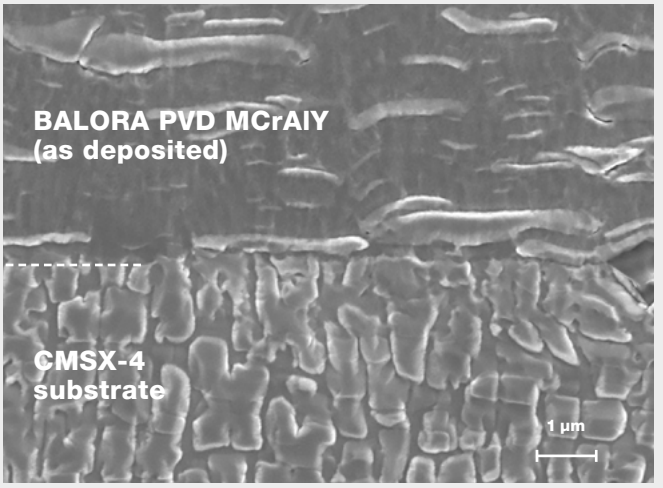


BALORA PVD MCrAlY provides an optimum oxidation barrier

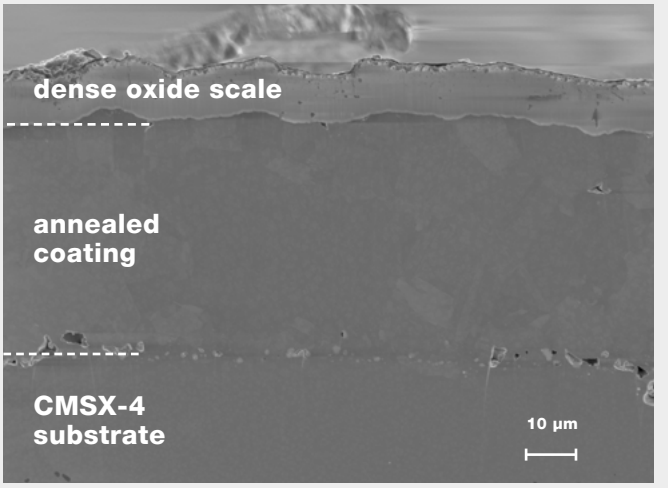
The extremely low porosity of BALORA™ PVD MCrAlY ensures a defect-free, dense re-crystallisation at high temperatures. The special composition of BALORA™ PVD MCrAlY is thus optimised for oxide scale formations on the surface because it forms a perfect oxidation barrier.

Its excellent interface properties are a further advantage. Regardless of the substrate, BALORA™ PVD MCrAlY enables an epitaxial growth at the interface, i.e. atoms arrange their structure in the same orientation as the layer below, resulting in an outstanding adhesion.

Interface as deposited



100 h 1'200 °C ambient air



Empowering BALORA PVD MCrAlY with high-end coating systems

Oerlikon Balzers' INNOVENTA giga coating system with Arc Evaporation Technology enables the deposition of coatings of highest quality. It is the largest of the high-tech INNOVENTA coating systems and is an ideal platform for coating large turbine blades with economies of scale for smaller blades. Its design allows accommodation of work-pieces higher than 1.7 metres with a substrate diameter of up to 70 cm and a loading capacity of up to 3'000 kg.

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Open a new world of possibilities with BALORA PVD MCrAlY Get in touch with us today!

At Oerlikon Balzers, we have the expertise and knowledge that allow our coatings to be fully tailor-made to meet our customers' requirements for erosion, oxidation and hot corrosion protection. In over a 110 coating centres world-wide in 36 countries, Oerlikon Balzers surface solutions are designed to bring our coating performance closer to you.

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