RiMax
TECHNOLOGY SRL

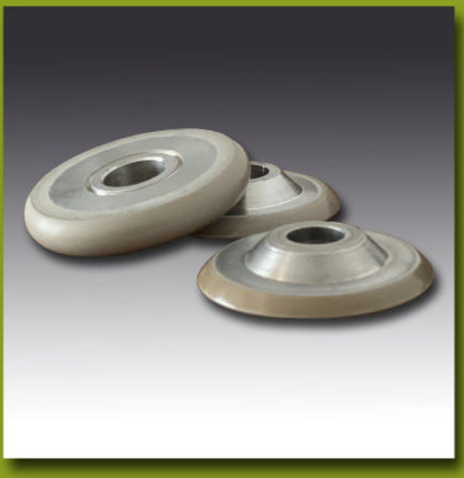
Ceramic and NanoCeramic Coatings

for wear protection
for electrical insulation
for thermal insulation

CATALOGUE

May 2020

Ceramic and NanoCeramic Coatings



Rimax Technology born in october 2010 to promote the product and the application of technologies made from our partner in the international and above all on the Italian market.
With more than 20 years of experience in the technical ceramic material and in the anti-wear coating for the industrial application, in particular in the textile market , we are able to submit you concrete solution at your problem of wear, corrosion, thermal and electrical insulation, chemical aggression.
In addition at the textile market , and more over in the chemical fibres production, we are present already in the food industry, mechanical production , nautical, army , where in addition at the wear resistance are well appreciate our high resistance at the chemical aggression and corrosion protection.

Our partner in this segment are :
Rauschert Heinersdorf – Pressig GmbH – Germania www.rauschert.com
Cambridge NANOLITIC - Inghilterra www.nanolitic.com

Ceramic and NanoCeramic Coatings

Ceramic Coatings by Plasma spray

Process

The ceramic powder melts within 0,5 seconds in a plasma flame at temperatures between 10,000 °C and 20,000 °C. The molten material is deposited at supersonic speeds on to a metal surface that has been pre-prepared by sand blasting.
For improved surface finishes the coatings can be machined with diamond tooling.

Corrosion protection and high dielectric strength by nano-technology.
The pores will be closed by nano-technology.
The nano-composites exist of molecules of SiO_2, surrounded by organic ligands and molecular structures.
By thermal treatment an embedded inorganic glass having a SiO_2 basis will envelop.

Surface structure

The ceramic coating has a laminar,porous structure that gives good adhesive strength and impact resistance. It also readily allows for the difference in the thermal expansion between the metal and ceramic.

Electrical Characteristics

The choice of ceramic coating allows for varying levels of electrical insulation or it can even be semi-conductive. For example, the material R103 is used for the electrical insulation of roller bearing outer casings. With a layer thickness of 150 µm, a dielectric strength of 1000V is guaranteed.

Ceramic and NanoCeramic Coatings

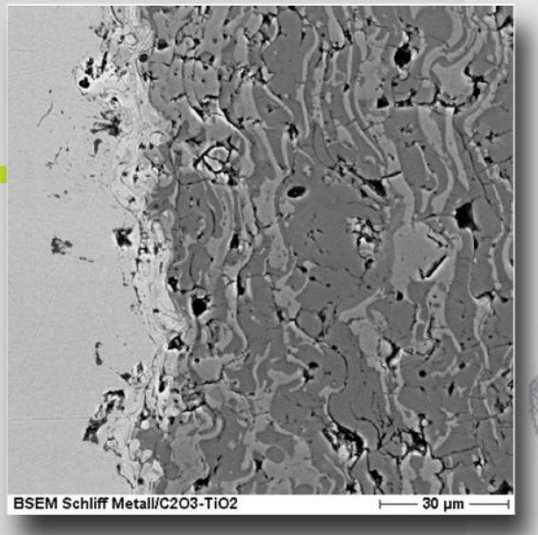
Ceramic Coatings by Plasma spray

Properties of the ceramic layer

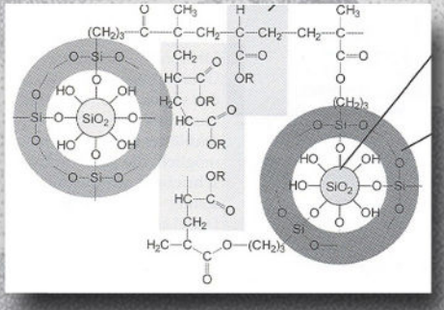
With the solidification of the ceramic a lamelar, porous structure of the layer will be generated .
The layer gets impact strength and adsorbs the different thermal expansion until to 700 °C .
The standard layer is Al2O3 / TiO2 with a thickness of 100 µ

We offer:

- Advice on problems of wear and insulation, also on the use of ceramic coatings and fully ceramic parts
- Fast manufacture of prototypes
- Coating of metal parts provided by the customer in quantities from 1 up to 10,000 pieces
- Repair of ceramic coatings
- Metal parts for coating can also be supplied
- Our own tool room
- Grinding and polishing on request



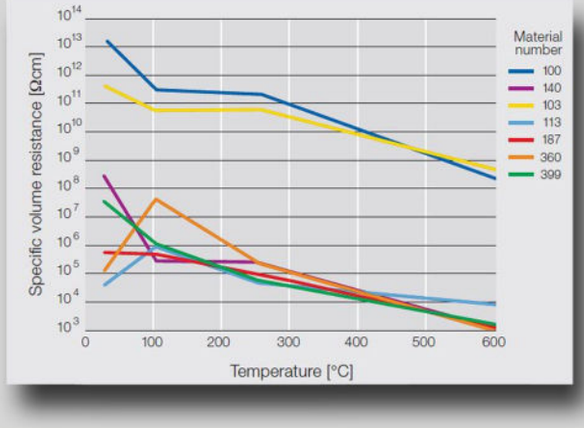
The sealing by nanocomposites closes the channels of the pores. The corrosion resistance and the electrical dielectric strength will be improved.
A dielectric strengh of 1,5 kV is measured in series.



Physical properties

layer material	Nr.		colour	wear resistance	electrical insulation	thermal insulation
Al_2O_3 / TiO_2	(97/3)	R103	grey	●	●	○
Al_2O_3 / TiO_2	(87/13)	R113	anthracite	●	○	○
Al_2O_3 / TiO_2	(60/40)	R140	black	●	○	○
Al_2O_3	(99	R100	white	●	●	○
ZrO_2 / CaO	(95/5)	R295	ivory	○	○	●
ZrO_2 / Y_2O_3	(92/8	R292	ivory	◐	○	●
Cr_2O_3	(99)	R399	grey green	●	○	○
Cr_2O_3 / TiO_2	(60/40)	R360	anthracite	●	○	○

● very well suitable ◐ conditionally suitable ○ not suitable



Ceramic and NanoCeramic Coatings

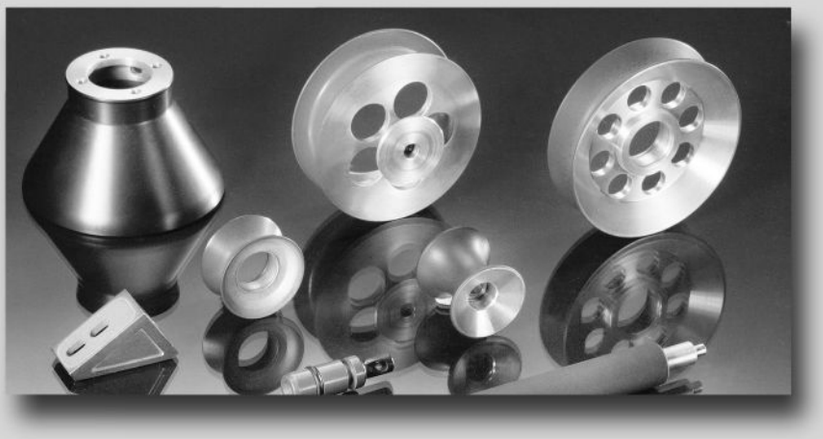
High Velocity Oxygen Fuel spraying HVOF

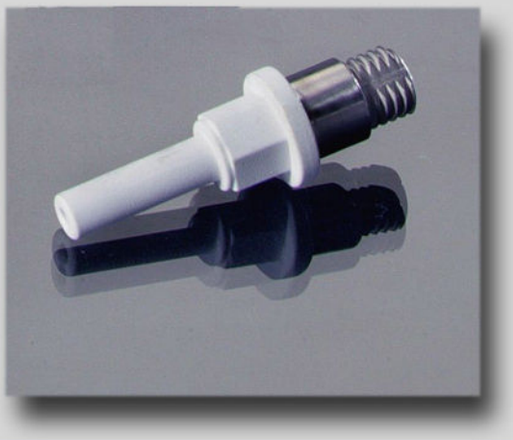
High Velocity Oxygen Fuel - HVOF spraying is a group of thermal spraying processes which spray flames at supersonic speeds, used to improve or restore a component's surface properties or dimensions, thus extending equipment life by significantly increasing erosion and wear resistance, and corrosion protection.

HVOF coating is a high-velocity spraying process, that use high -impact energy to produce dense coatings at relatively low temperatures.

Process details

As with all thermal spray coating processes, HVOF coating material is heated and accelerated by a gas stream to a component's surface, to attain better properties. With the HVOF coating process, the gas stream is produced by mixing and igniting oxygen and fuel (gas or liquid) in a combustion chamber and allowing the high-pressure gas to accelerate through a nozzle. A powder is introduced into this stream where it is heated and accelerated towards a component's surface.
The resulting thermal spray coating consists of thin overlapping platelets.
Cleaning and surface preparation are critical and require a well-equipped workshop.





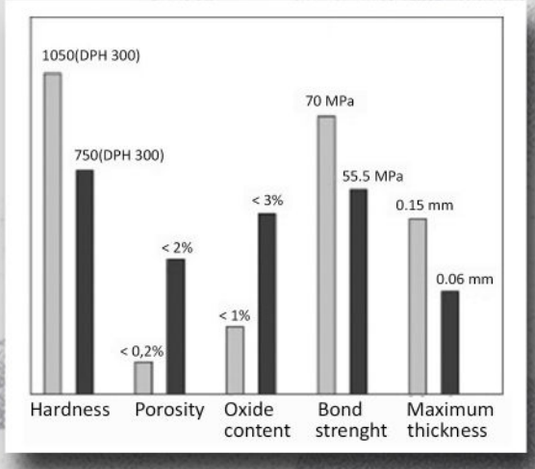
Ceramic and NanoCeramic Coatings

HVOF

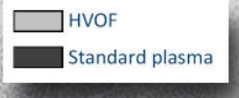
Application

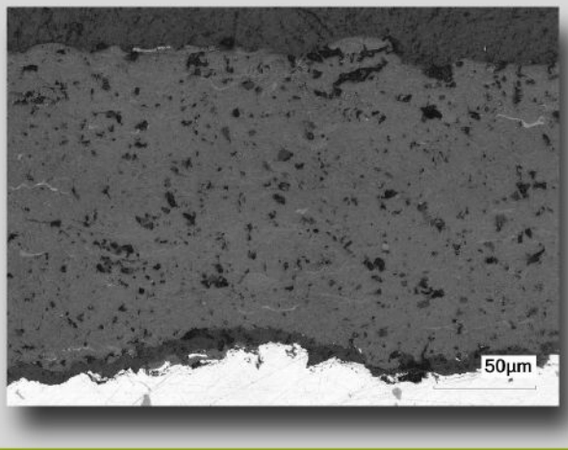
The main field for HVOF are applications for abrasion and sliding wear.
The following are some example for HVOF application :

- nozzles of water jet cutting tools
- rolls for paper and foil producing industries
- rolls for paper and foil producing industries
- sliding areas of pressing irons
- valves seats
- pumps and turbine shaft seal area are in petrochemical applications, and mechanical seals are only some examples.
- under the dynamic seal (O-ring) of mechanical seal sleeve

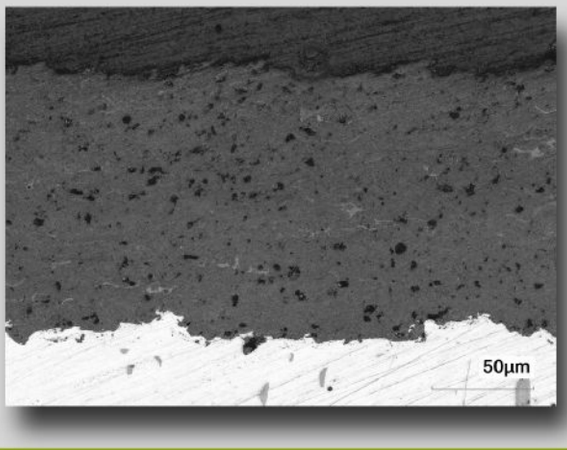


Advantages of HVOF





Al2O3-TiO2
F4_dk_2



Al2O3-TiO2
HVOF_A_2

Ceramic and NanoCeramic Coatings

Nanoceramic Coating for Light Alloys

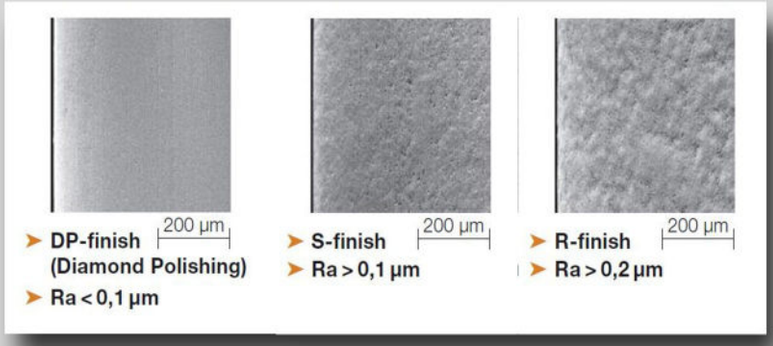
Nanoceramic is a new treatment which provides the surface of aluminium alloy with a dense, hard, wear resistant and corrosion resistant ceramic layer

- Non-Toxic, environmentally friendly coating process.
- Components can be recycled at end of life.
- Proven technology.
- Provides for flexibility in component shape.
- Typical aluminium alloys 2000, 5000 series, 6000 series, 7000 series.

ECO-Process of Nanoceramic deposition

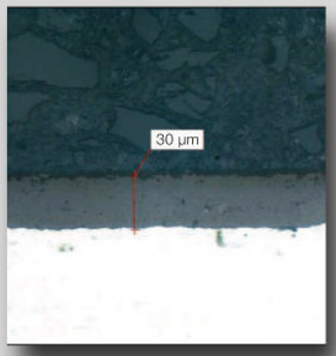
- Process: electrochemical oxidation (ECO) in a proprietary colloidal alkaline electrolyte
- Process combines oxidation of substrate metal with elementary co-deposition of electrolyte material
- Green Technology: Environmentally friendly process, no hazardous effluents or gases are used or emitted
- No pre-treatment required, clean-rinse only
- Deposition rate – around 2 micron per minute
- Can be applied to complex shapes
- Superior to Anodising and Plasma Electrolytic Oxidation (PEO)

SEM shoving examples of Nanocoated surface finisches with 6082 alloy



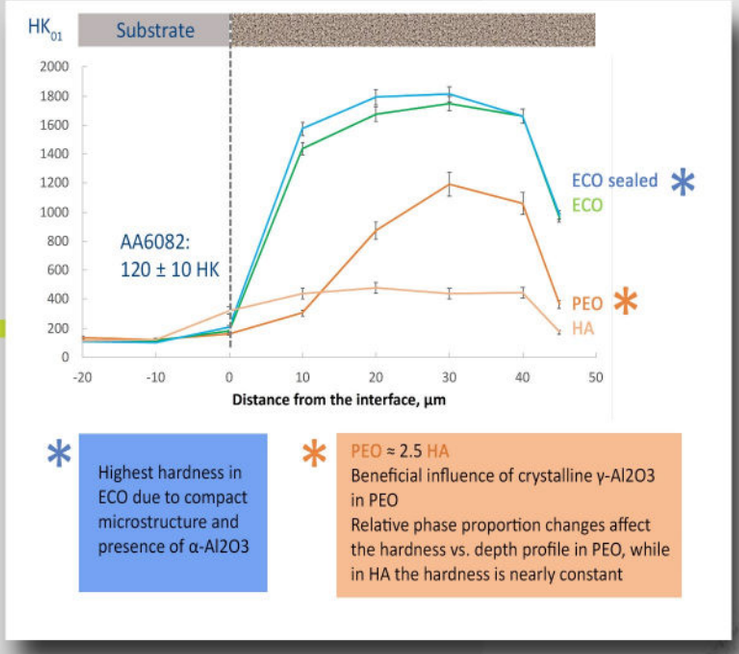
SEM x - section of NanoCeramic coating on aluminium 6082

- Thickness of layer 30 µm
- Hardness of layer 1550 to 1700 HV 0,1
- Virtually pore-free layer

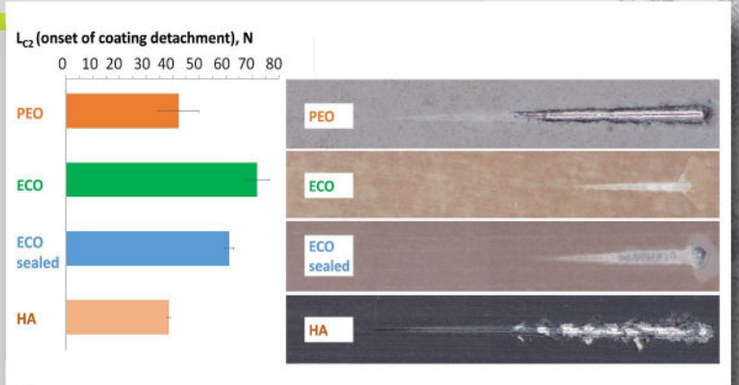


Ceramic and NanoCeramic Coatings

Cross-sectional Knoop micro-indentation



Progressive load scratch tests



Nanoceramic Coating for Light Alloys

Properties

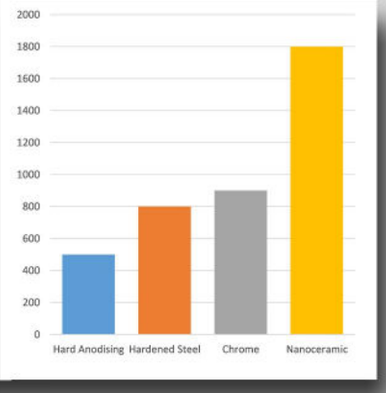
- High hardness and wear resistance
- Perfect surface finish properties
- High density, low porosity
- Electrically insulating layer
- Excellent adhesion to substrate
- High corrosion resistance compared with other coatings
- Low Friction surface
- Colours range from cream to ivory to beige to grey to black depending on alloy used.

Advantages

- Gives engineers and designers the option to replace heavy steel with modern lightweight materials.
- Lower component machining costs.
- Excellent heat transfer of aluminium substrate.
- No final coating grinding costs, due to accurate control of coating thickness.
- Possibility to coat more complex shapes than with conventional coatings.
- Superior engineering properties when compared to conventional coatings.
- Many possible new industrial applications..

Material Hardness, Hv

- Composition: Nanocrystalline oxide ceramic contains Gamma and Alpha phase Aluminium Oxide (crystallite size 30-80 nm)
- Controlled thickness: 5 - 70 um
- High Microhardness: 1000-1800 Hv (alloy dependent)
- Low friction coefficient (polished) pared with steel in standard lubricated environment: 0.04-0.1
- High corrosion resistance: upto 1000 hours salt spray (alloy dependant)
- High adhesion to substrate: > 300 MPa
- Continuous operating temperature: > 500° C,
- Inorganic construction
- Dimensional accuracy: Ceramic grows inside the substrate.



RiMax Technology Srl

Piazza Garibaldi, 8 - 21013 GALLARATE (VA) SEDE OPERATIVA: Via Fratelli di Dio, 5 - 21052 BUSTO ARSIZIO (VA) - ITALY
Tel + 39 0331 847949 - Fax + 39 0331 847949
e-mail: info@rimaxtechnology.com

www.rimaxtechnology.com

design by Studio Tecnico Colzani - info@studiotecnicocolzani.it - ITALY