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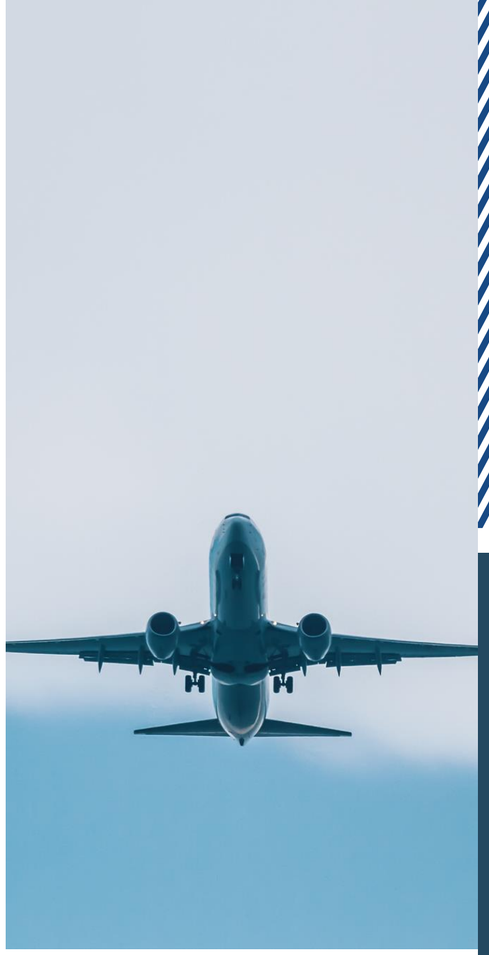
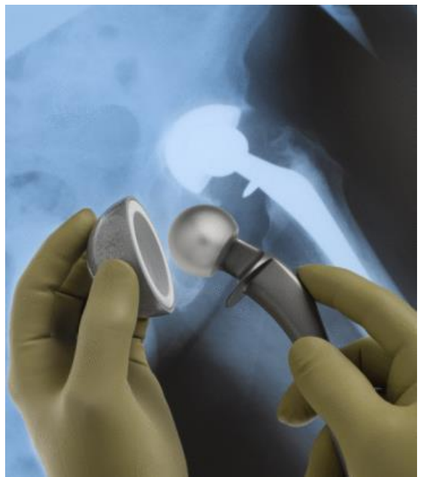
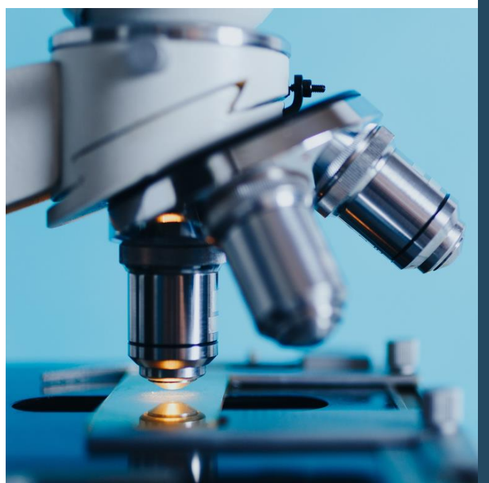
Follow us on RESCOLL

RESCOLL



High performance functionalization
by Cold Gas Spray





RESCOLL GROUP

CERTIFIED ISO 9001

CERTIFIED ISO 13485

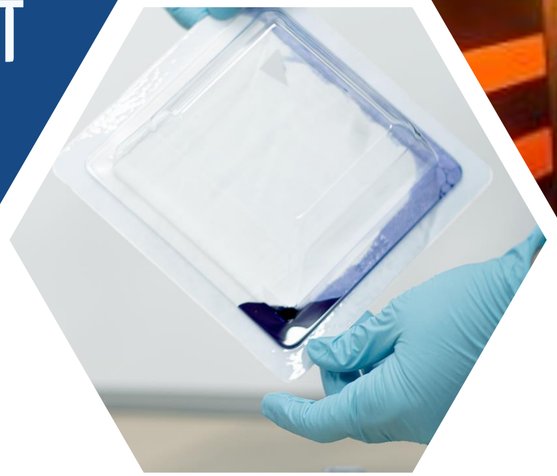
18 M€
TURNOVER

15000 M²
LAB SURFACE

› 1000
CUSTOMERS

› 1M€
ANNUAL
INVESTMENT

180
EMPLOYEES



cofrac
ESSAIS

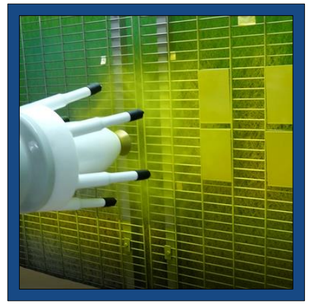
Nadcap
Administered by PRI

EXPERTISE

MATERIALS & PROCESSES

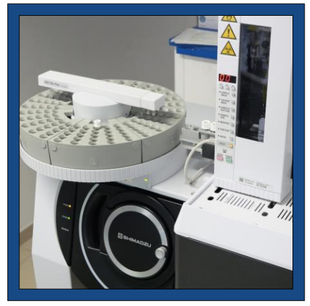
RESINS & ADHESIVES

BONDING PROCESS



PAINTS & COATINGS

CHEMICAL ANALYSIS



CHROMATOGRAPHY & SPECTROMETRY

COMPOSITES

ADDITIVE MANUFACTURING

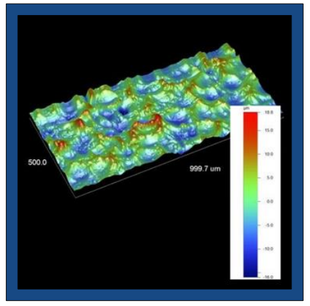
PLASTICS

STATIC & DYNAMIC MECHANICAL TESTING

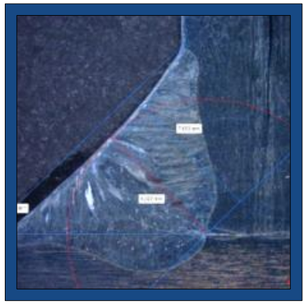
CRYOGENIC TESTING

TESTING

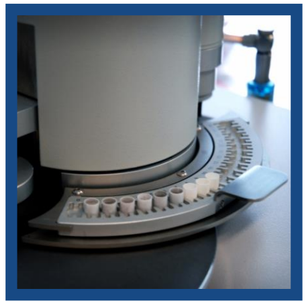
FIRE REACTION



COATING & SURFACES ANALYSIS



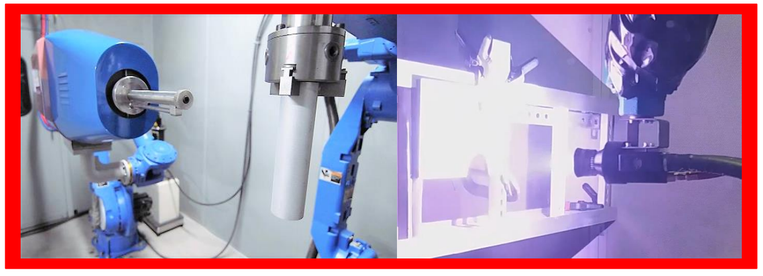
METAL ANALYSIS



THERMO MECHANICAL TESTING

STRUCTURES & ENDURANCE

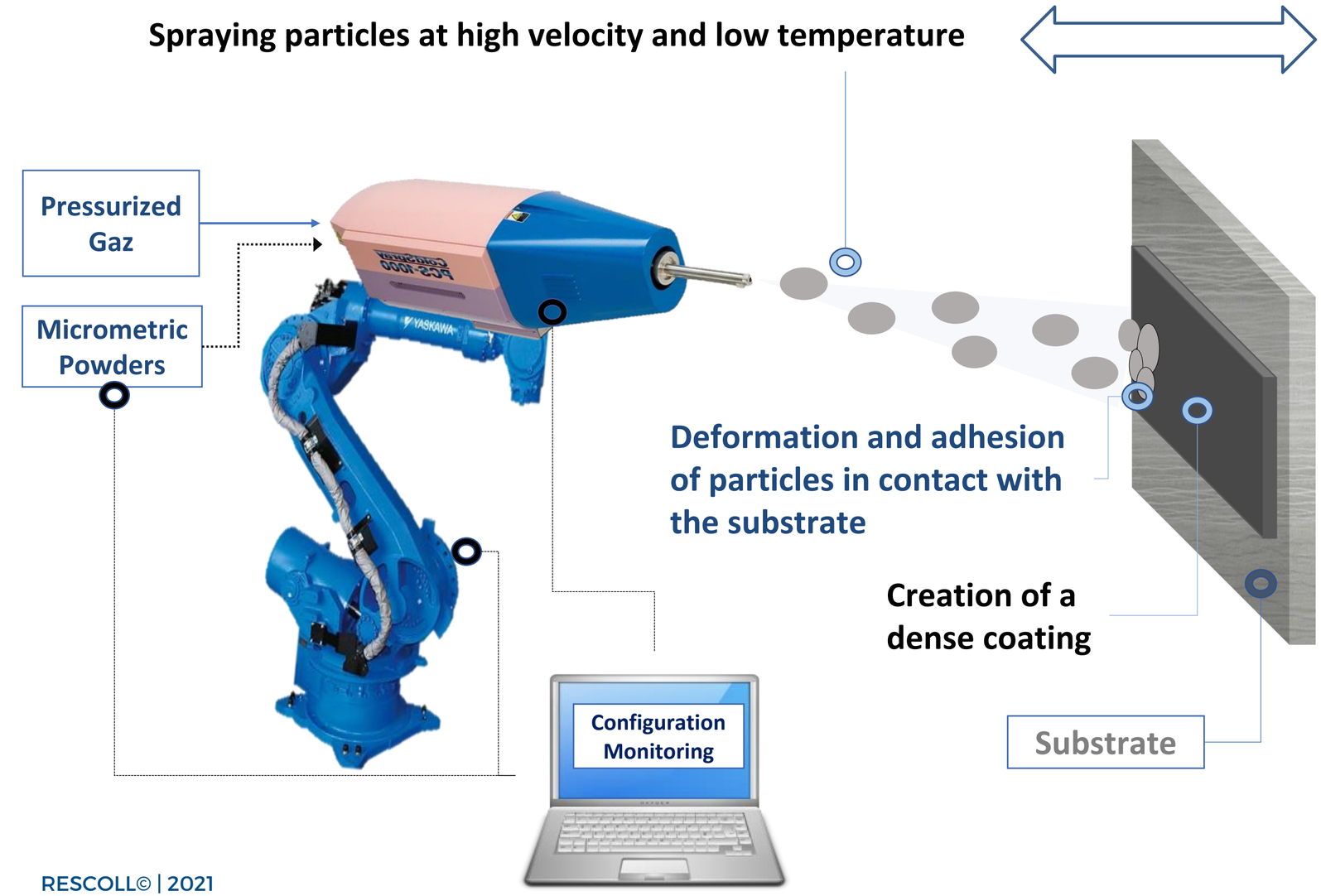
AGEING



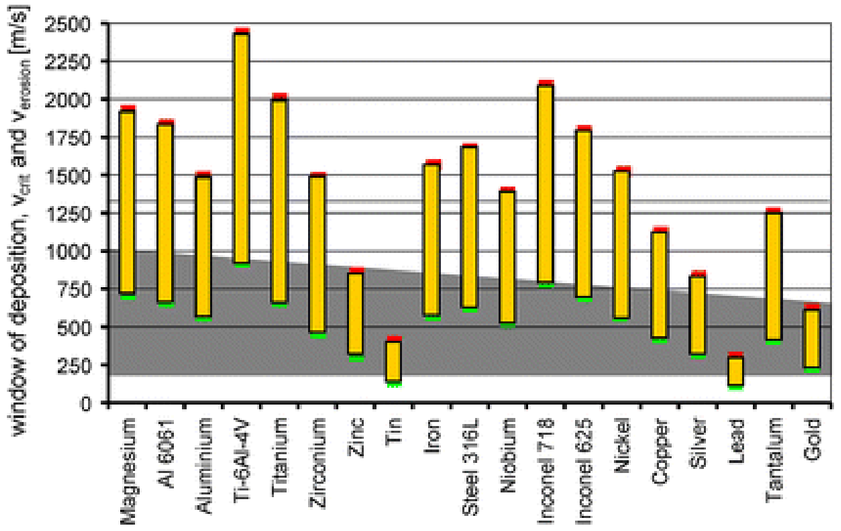
THERMAL SPRAYING
Cold Gas Spray / Wire Arc Spray

COLD GAS SPRAY : MAIN PRINCIPLE

Spraying particles at high velocity and low temperature



The required deposition speed varies depending on the material being sprayed



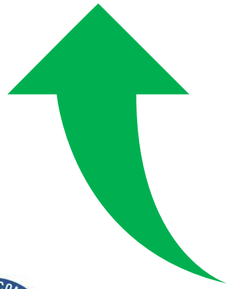
Calculated critical velocities and windows of deposition for selected metals

COLD GAS SPRAY : MAIN PRINCIPLE

Create coatings in a wide range of materials, onto several types of substrates.

Properties, advantages and limitaions :

- Flexibility in Substrate / Coating selection : wide range of possibilities (see next slide).
- Coupling dissimilar materials.
- Ability to create coating thicknesses from 0.1 to several millimeters.
- High bond strenght.
- Possibility to set the porosity rate.



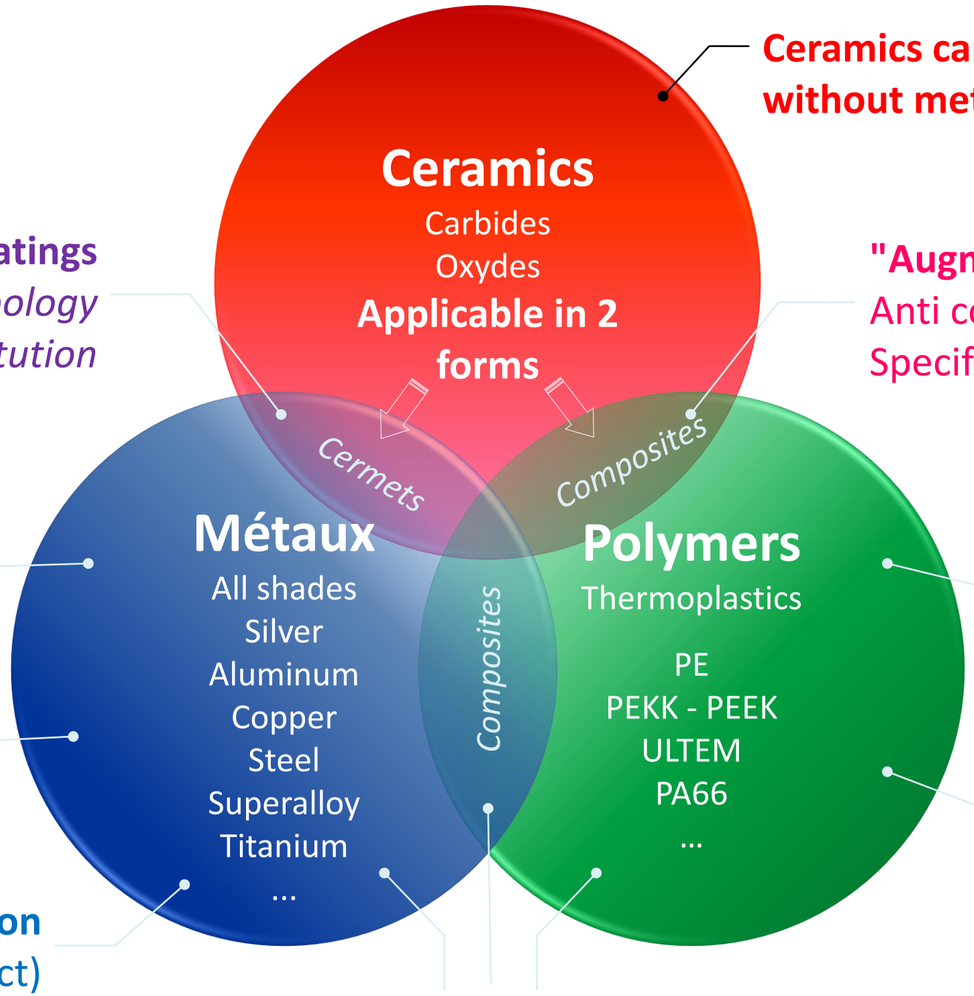
- No fusion of materials: minimum thermal imput to the substrate, no oxidation.
- Environmental, health, and safety (no bath, no harmful emissions).
- Little or no masking.
- Few dimensional constraints (large parts).

- *Near-zero ductulity of the created deposit.*
- *Requires access to the area to be coated (no holes).*
- *Limited availability of standard specifications (To be created).*

Cold gas spray technology is suitable for :

- **Surface functionalization providing high performances properties.**
- **High added value parts and functions / on sensitive components.**
- **Customized material coatings.**

MATERIALS POSSIBLITIES



Ceramics cannot be deposited without metallic or polymer binder

"Augmented" metallic coatings
Anti abrasion, tribology
Chromium VI substitution

"Augmented" polymer coatings
Anti corrosion
Specific coating

Surface treatment
Conductivity, anti corrosion

Construction
Additive manufacturing

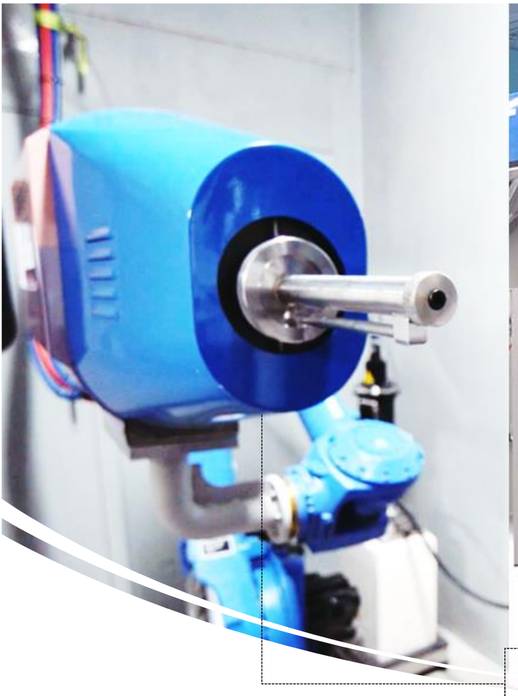
Reconstruction
Repair (wear, defect)

Surface treatment
Electrical insulation, anticorrosion, …

Construction
Additive manufacturing

Specific functionality
Localized deposit

THERMAL SPRAYING - RESCOLL

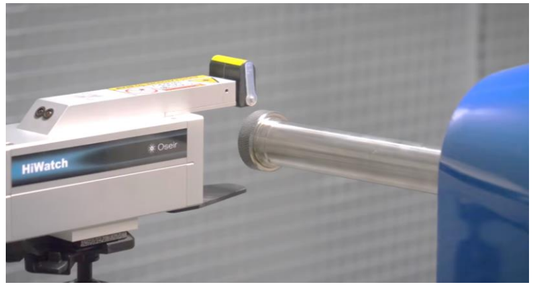


Wire Arc Spray

High Pressure Cold Spray
PCS1000 PLASMA GIKEN
50Bars / 1000°C

Low Pressure Cold Spray
D526 DYCOMET
8Bars / 600°C

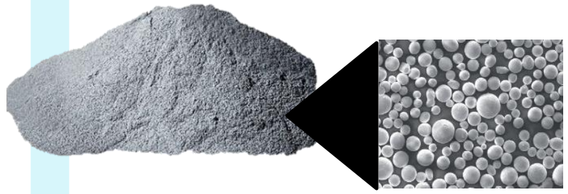
Monitoring by Particle Speed Measurement System
Hi-Watch OSEIR



CONDUCT OF A STUDY

1-Material selection

Size and shape selection



Analysis by ICP

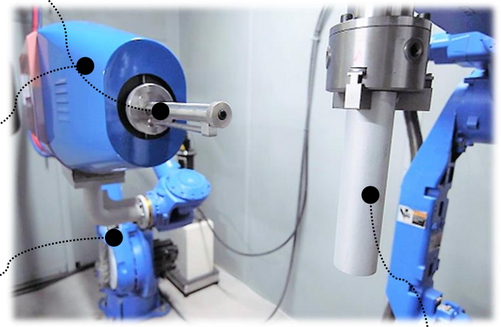
2-Development on samples

Nozzle type

Nitrogen Pressure & Temperature

Powder flow rate

Robot Strategy



Surface preparation : roughness, temperature

3-Characterization

Mirograph (Optical or MEB)
- density/porosity rates
- compaction (etching)
- interface analysis

Chemical analysis : comparison of chemical composition with powders

Corrosion resistance

Microhardness

Bond strength (1 to 70MPa)

Tensile test
Bending test

Residual stress analysis

Conductivity/resistivity

Other on demand…

4-Prototyping

- Implementation of specific tooling and robot programs.
- Application of the parameters defined in the previous phases.
- Verification of initial specifications.
- Final report including a cost calculation.

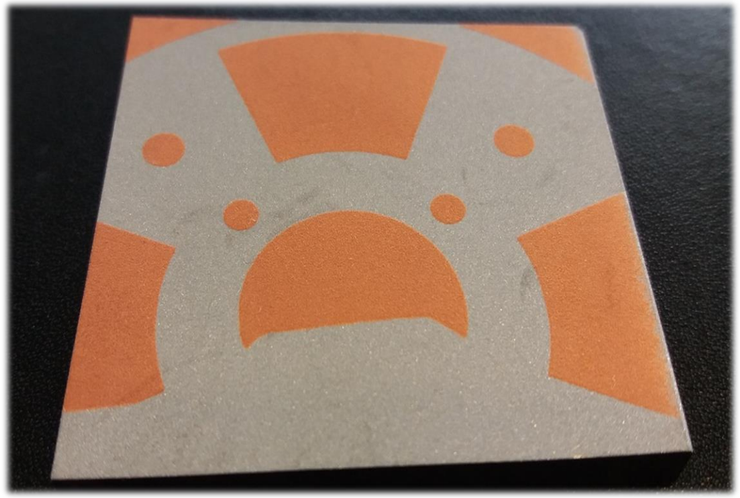
EXAMPLE : CONDUCTIVE COATINGS

Copper / aluminum / silver deposition on aluminum, steel, composite or polymer parts:

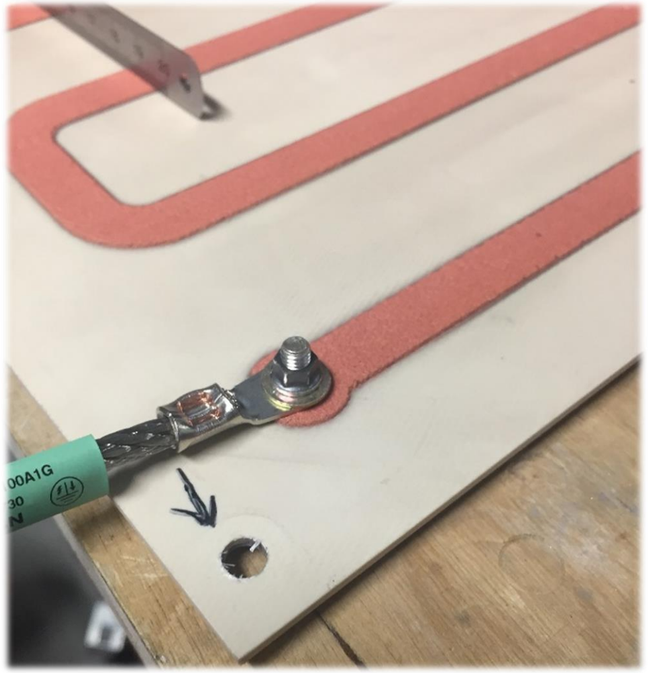
- electrical conductivity,
- thermal dissipation (slow charge cooler),
- solder interface,
- Biofouling.

Conductivity level : up to 90% of the bulk material (variable according to the type of substrate).

Deposition efficiency : depending of geometry to be realized : up to 80%.



Creation of a pattern for heat dissipation and soldering gap

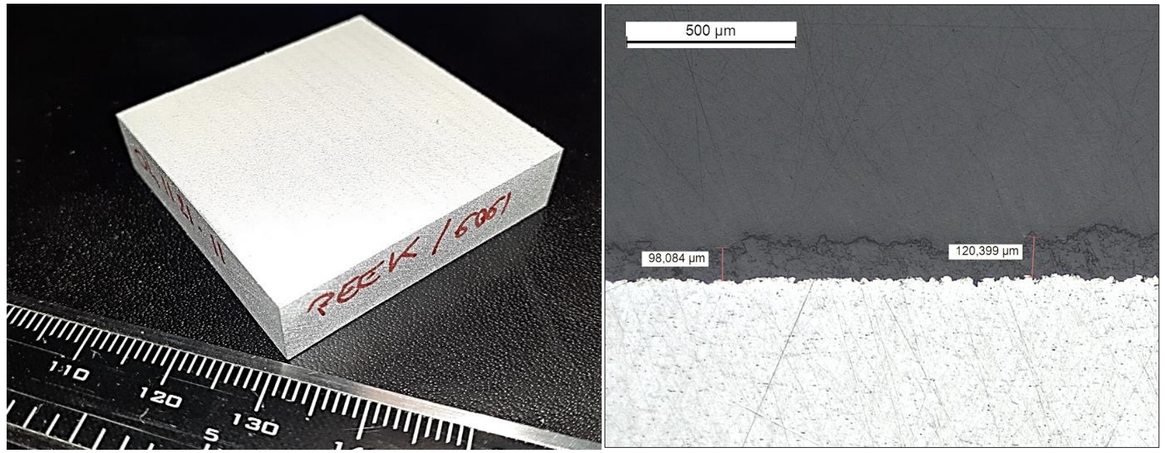


Conductivity measurement: copper on composite part

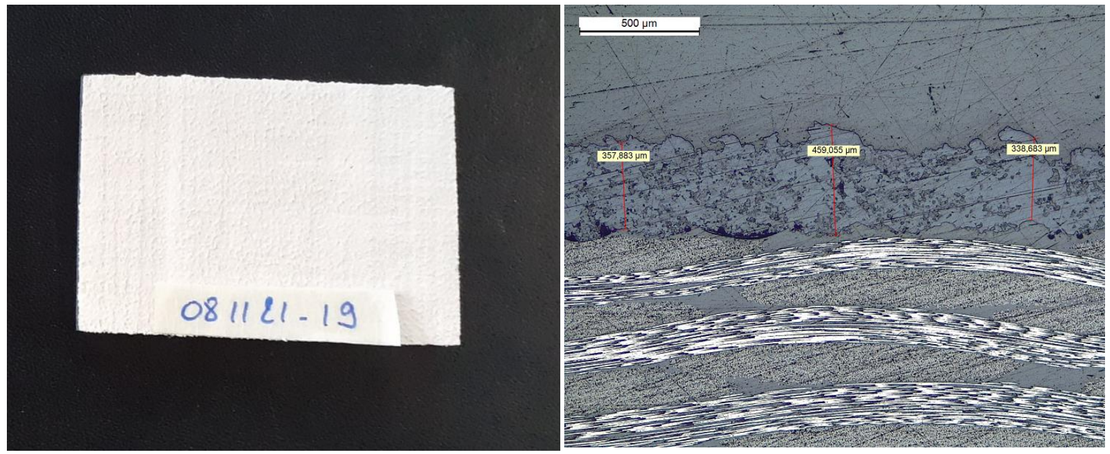
Some applications are already industrialized.

EXAMPLE : POLYMERS COATINGS

Pure Polymers (like PEEK) or composites (polymer + oxide) can be deposited without degradation.
Spraying onto Composite, Polymer or Metallic substrates with high deposition rates and potentially in handheld use.



PEEK on Aluminum (thin Coating) ± 100µm
Also on Titanium or Steel



PEEK on Composites
Carbon or glass fiber + thermoplastics

Expected applications :

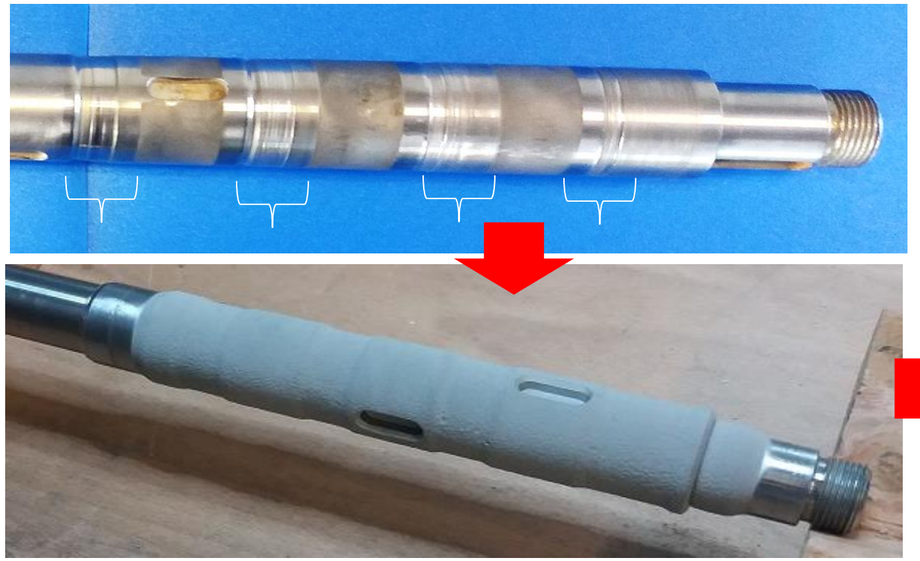
- coating : electrical insulation, anti-corrosion, waterproofing,
- undercoat for other coating or metal functionalization,
- repair polymer used parts,
- specific demands…

EXAMPLE : REPAIR

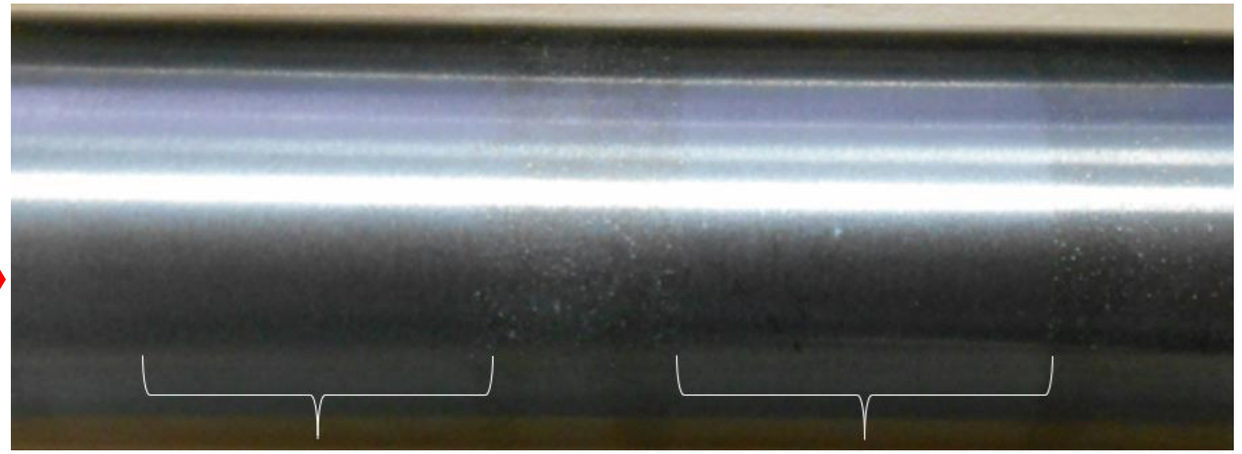
Possibility of repairing a wide range of metallic parts : aluminum (all shades), copper, steel, titanium, inconel …
Thermal effects are limited during the process, which greatly reduces the risk of degradation compared to other surfacing techniques.

Relevant application:

- sensitive / high valued parts,
- thicknesses from 0.1 to 1mm,
- need to spray the same material as the part.



Restoration of an AISI 410 steel SHAFT



MULTILAYERS & ON DEMAND MATERIALS

Multilayers

Possibility of layering different materials to create "sandwich" coatings with multiple properties (example bellow).

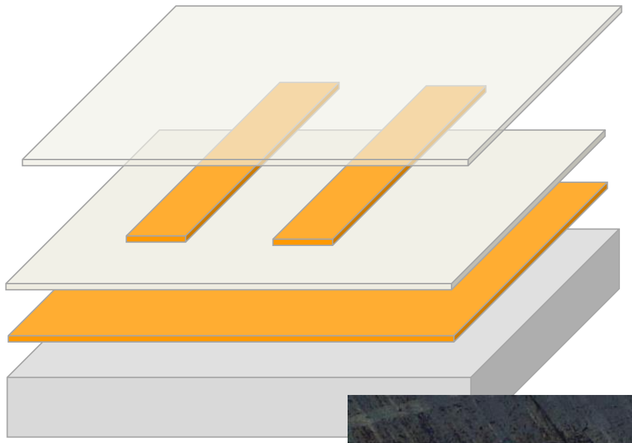
Final insulation layer

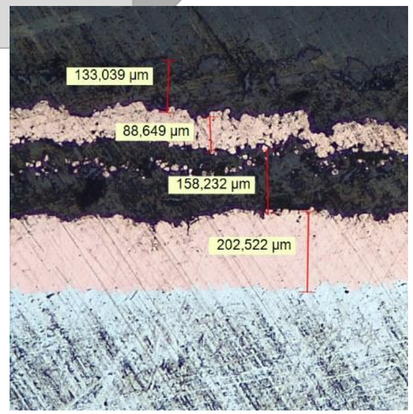
2nd copper layer (tracks)

Electrical insulation layer

1st copper layer

Aluminum Base plate

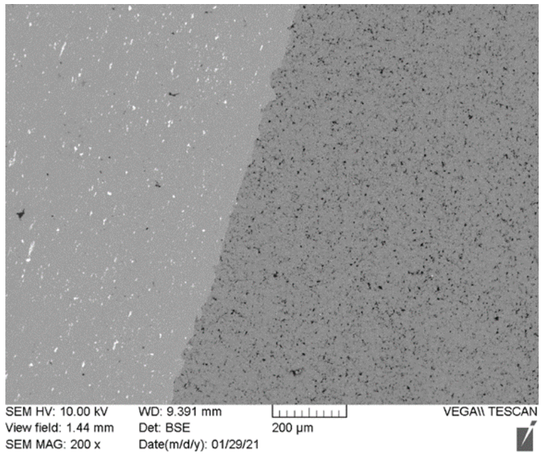




PEEK and copper multilayer

On demand materials

Possibility of making a wide variety of powder mixtures (metal, ceramic, polymers) to create new functional coatings.



Aluminum + ceramic particles

Luminescent metallic coating

A GLOBAL OFFER

DEVELOPPEMENT OF INOVATIVE PRODUCTS AND PROCESSES

PROTOTYPING INDUSTRIAL SCALE UP

QUALIFICATION OF PRODUCTS &PROCESSES

PRODUCTION CONTROL

EXPERTISE FAILURE ANALYSIS

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